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VIEWS, NEWS AND INTERVIEWS.

In a recent civil service examination one of the questions asked was:

"What apparatus is required in a well equipped electric lighting plant of five hundred 16-candle-power lamps' capacity?"

"None," was the answer of the candidate who won the examination.

A well known naval officer is given to making unusual remarks and apostrophizing out-of-the-way matters for the benefit of his friends. His latest jewel of thought was called forth through seeing a sparrow standing on one leg on a telegraph wire, the other leg being drawn up to his body. The naval officer remarked, wisely: "How wonderful are the provisions of Nature! See that little bird on the wire, and note his extraordinary instinct. You see he has one leg drawn up under him so as to insulate himself from the current passing through the wire. How wonderful are the provisions of Nature!"

An order has been received at the Patent Office for a copy of every patent issued by the United States. It is the largest order ever received, and will cost $14,000 to execute.

The General Electric Company has purchased of Union College 76 acres of land at Schenectady at $750 an acre. The land, which is over a mile from the company's factory, will not be used for manufacturing purposes, but for residential sites for the officers and leading employés of the company. This sale will give to the college nearly $60,000, which will be devoted to carrying on the higher educational work of this well known institution. It is the intention of all the leading officials of the General Electric Company to make Schenectady their home and put up fine residences there.

The Paris Edison company has recently constructed a tunnel connecting its station at St. Denis, near Paris, with the central station in the Avenue Trudaine. This has been done in order to run bare conductors, which will carry a current at 2,100 volts, actuating two 1,200-kilowatt transformers at the city station, where the generating machinery is now overloaded. The tunnel will be six feet in height.

A new device for preventing the alteration of checks consists of a set of numbered metallic disks electrically connected with a source of current. By this means the numbers on the disks are heated to branding temperature, and on being pressed to the surface of a check or similar paper the amount named therein is burned, a process which defies the usual methods resorted to by check raisers.

"Happy Jack" Dunn, of Cleveland, Ohio, is a human lightning rod. He coyly admits that he himself has taken 1,350 volts without losing more than half a day. He has had so many trolley wire shocks that he has trouble in remembering them all. Dunn ought to be able to get a job as a human resistance coil in any experimental laboratory.

A correspondent of the London *Standard*, writing from Dover, Eng., where he had been witnessing Marconi's experiments with wave telegraphy across the English Channel, seemed more amazed by the fact that messages were sent as easily in French as in English than by anything else he saw.

In an article on the New York Fire Department, by J. Warren Lamb, C. E., of Cooperstown, N. Y., published in the *Water and Gas Review*, attention is called to the department's lack of water power to fight high-building fires, and Mr. Lamb makes three suggestions: (1) That there should be an auxiliary system, consisting of stationary pumping machinery of great power, along the river fronts, supplying water to a separate pipe-line with hydrants; (2) that the pumping-station be operated by electricity, and (3) that the present portable steam fire engines be supplanted by portable electric pumps. The electricity for the stations and the portable pumps would be supplied from a central power-station.

President Rossiter, of the Brooklyn Rapid Transit Company, recently went to Chicago to study the electric elevated system in operation there, with the object of introducing it on the lines of the Brooklyn elevated system.

CELL-ROOM OF THE CASTNER-KELLNER ALKALI WORKS AT WESTON POINT, ENGLAND.

THE CASTNER-KELLNER ALKALI WORKS AT WESTON POINT.

BY JOHN B. C. KERSHAW, F. I. C.

The works of the Castner-Kellner Alkali Company at Weston Point, Runcorn, Eng., are interesting as indicative of the change which is taking place in one of the oldest manufacturing industries of that country—the alkali industry. In the year 1888 the late Dr. Hurter declared to the members of the Liverpool Section of the Society of Chemical Industry, that electrolytic processes of alkali manufacture could never be worked profitably on an industrial scale.

So great was Dr. Hurter's reputation that the majority of those connected with the English alkali industry accepted this opinion as absolute fact, and one and all ceased to give much attention to the efforts of those foolish people who were trying to do what Dr. Hurter had declared was impossible. But Dr. Hurter had made the mistake of generalizing from insufficient data; and though his deduction was perfectly correct as applied to his own conditions of experiment, it was no longer so when applied to other conditions of electrolytic decomposition. Only two years after this prophecy was uttered, it was proved to be valueless, for the Chemische Werke at Greisheim, near Frankfort, after lengthy experimental trials, commenced in 1890 to make caustic potash and bleaching powder by an electrolytic process, upon an industrial scale. Since that date the electrolytic process for the manufacture of caustic alkalies and bleach has been adopted in many places, chiefly abroad, and had not the formation of the United Alkali Company in the year 1890 practically placed the English alkali industry entirely under Dr. Hurter's control, it is probable that there would have been a much greater extension of these new methods of manufacture in Great Britain. A study of the export and import returns for Germany and America as regards alkali and bleach, in recent years, affords conclusive proof of the extent to which our country is losing ground as a producer of heavy chemicals, and though this decline of British export trade in alkali and bleach is not solely due to the adoption of electrolytic processes of manufacture abroad, this change is undoubtedly

largely responsible for the increase of competition from Germany. In 1891 the exports of alkali from the United Kingdom amounted to 311,370 tons; in 1898 they had dropped to 188,556 tons. In 1891 exports of bleach amounted to 75,685 tons, in 1898 they were only 56,184 tons.

The erection of the large electrolytic alkali works of the Castner-Kellner Company, at Weston Point, Runcorn, close to the chief center of the English alkali industry is, therefore, but another sign of the extent to which the older process of manufacture is being pressed by the new. A few miles away, at Widnes, are to be seen numerous examples of the old style of Le Blanc chemical works, with their huge acid chambers and towers, and their general appearance of dirt and dilapidation. The contrast between the old and the new is all the more striking at present because many of the Le Blanc works have been stopped in recent years; and a disused chemical works is, in the writer's opinion, a symbol of the very quintessence of ruin and decay. The electrolytic works, on the other hand, has all the advantage of new buildings and new paint, and Dame Nature takes kindly to the new method of manufacture and allows oats to grow within reach of its boundary walls. Whether oats will continue to grow there is, however, a matter of doubt. The electrolytic process, simple as it may be when compared with the older process of alkali manufacture, nevertheless involves the liberation of chlorine as a gas; and chlorine, when once liberated, is very difficult to wholly reabsorb, and is apt to escape and injure the vegetation of the neighborhood. But the suppression of pyrites kilns, of acid chambers, of salt cake furnaces, and of acid towers—all features of the Le Blanc works, and all contributors to the poisoning of the atmosphere with deleterious acid gases—is a distinct gain, and, judging the old and new processes of alkali manufacture solely from the hygienic standpoint, there can be no doubt that the latter is the better of the two.

The two processes start with the same raw material, common salt, and are designed to effect the same ends, namely, the separation and conversion of the sodium into sodium hydrate, and of the chlorine into bleaching powder. In the electrolytic method of manufacture, one operation in the electrolytic cell produces a solution of caustic soda and free chlorine. To obtain the same results by the Le Blanc process, a whole series of operations and the production of several by products are necessary. Pyrites is burned in order to obtain sulphuric acid. This acid is used to convert sodium chloride into sodium sulphate (salt cake). The sodium sulphate is converted into sodium carbonate by roasting with coal and limestone. The sodium carbonate is then changed into hydrate by boiling with caustic lime. As regards the chlorine, three more operations are necessary in order to condense and decompose the hydrochloric acid gas, liberated when the salt and sulphuric acid are brought together; and one more by-product is obtained. The superiority of the electrolytic process over the older Le Blanc process, as regards simplicity, is therefore even more marked than its hygienic advantages.

The Castner-Kellner process differs from the other electrolytic alkali processes that have received industrial trial, in the means taken to remove the sodium, liberated at the cathode, at once from the further action of the current. In the Hargreaves-Bird process a combined diaphragm cathode of peculiar construction is used and the cathode compartment of the cell contains only steam and carbonic acid gas. In the Castner-Kellner process mercury is used as cathode material, and the sodium amalgam which forms is automatically removed at short intervals from the cathode compartment of the cell. In the Hulin process a somewhat similar effect is obtained by the use of fused salt as the electrolyte, and of molten lead as the cathode material.

The details of the Castner cell are as follows:

A cell built up of slate is divided into three compartments by two partition walls, which dip into, but do not close, grooves in the bottom slab of the cell. The two end compartments are entirely closed; the center one is open. The end compartments are supplied with a strong solution of common salt, or of potassium chloride; the center one is fed with water. Mercury, sufficient in quantity to cover the bottom of the cell to a depth of one-eighth inch, is then placed in the cell, and electrical connection is arranged between this layer of mercury and the negative terminals of a continuous current dynamo. The positive terminals of the same dynamo are connected with

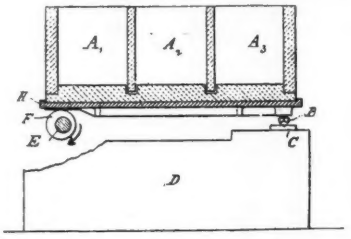


FIG. 1.—CROSS-SECTION, CASTNER-KELLNER ELECTROLYZING CELL.

carbon or platinum anodes, suspended in the solution of chloride in the end compartments of the cell.

When the electrical connections are made, the sodium chloride is decomposed by the current passing from the carbons to the mercury. Chlorine is liberated in the anode chambers as a gas, and is carried away by suitable exhaust fans to the bleach chambers, while the sodium ions migiate towards the mercury, and unite with it to form a sodium-mercury alloy, or sodium amalgam.

Were no provision made for renewing the mercury surface, the crust of amalgam would soon completely cover it, and cause the voltage required per cell to increase rapidly. The amalgam is automatically moved into the center compartment of the cell at short intervals by means of the device patented by Castner in 1893, and illustrated by Figs. 1 and 2. The cells are all built and mounted in such a manner that, by means of the shaft E and eccentrics F, they can be periodically subjected to a slight rocking movement of about one-fourth inch. This suffices to mix the mercury and the amalgam, and to cause fresh supplies of the

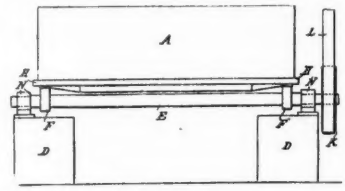


FIG. 2.—END ELEVATION, CASTNER-KELLNER ELECTROLYZING CELL.

mixture to be continually brought into the center compartment of the cell where it is decomposed by the water. When the cell is horizontal, as shown in Fig. 1, both anode compartments are taking their share of the current supply, but as the motion of the eccentric continues, the cell slightly rises in front, and the mixture of mercury and amalgam flows by gravitation into the compartments A_2 and A_3. After a brief stay in this position, the revolution of the eccentrics brings the cell back again to the horizontal position, and then causes the cell to dip slightly in front. The mercury, freed from its sodium by contact with the water in A_2, now flows back into A_1, and its place is taken in A_2 by the mixture of mercury and amalgam from A_3. The anode compartments A_1 and A_3 are thus alternately in action as decomposing chambers of the cell, while in A_2 there is a constant supply of mercury and amalgam ready for the action of the water. In actual operation of the process some difficulties were at first encountered, due to the tendency of the chlorine to form Hg_2Cl_2 in the anode chambers of the cell, and to the loss of mercury with the escaping hydrogen in the center compartment of the cell. The writer is not aware how Mr. Castner has overcome the first difficulty; the second has, however, been surmounted by adopting a method suggested by Dr. Kellner.

A grid-shaped electrode of iron is suspended in the water in A_2, and is placed in electrical contact with the mercury and amalgam lying on the bottom of the compartment. The couple acts as a primary element; the sodium of the amalgam combines with the water, and the hydrogen ions are set in migration towards the iron. The hydrogen gas, which is thus liberated as a result of the chemical action, $Na + H_2O = Na\,OH + H$, is set free, not at the surface of the mercury, but at the grid-shaped iron electrode, and it escapes into the air without causing any loss of mercury. The electro-motive force created by the reaction is also rendered of practical value, and diminishes that actually required to decompose the solution of salt in the anode compartments of the cell.

The erection of the works at Weston Point was commenced in 1896, and in 1897 the first 1,000-horse-power installation was set in operation.

The results were satisfactory, and at the annual meeting of the company, held in London on May 27, 1898, it was stated that the trading profits on the seven months' operation of the first unit of their plant had been £9,161. Some difficulties had been met with, however, due to impurities in the brine, and the second unit of plant, which has since been set in operation, is understood to be working upon potassium chloride in place of sodium chloride. The erection of two more units of machinery and plant, making, in all, 4,000 horse-power, was also at once put in hand; but writing on October 18, 1898, the secretary informed the writer that these were still in progress. In October an interim dividend of eight per cent was declared, so that this company appears to be firmly established, and to have proved that the electrolytic alkali manufacture can be made to pay even in England.

There have been no estimates published of the cost of alkali and bleach by the Castner-Kellner process, and in the absence of any data relating to the losses of mercury and to the costs of repairs and renewals, it is difficult to form a reliable estimate of the cost per ton of alkali and bleach by this process. The following table is, however, interesting as showing the wide variations between the estimates of different authorities. The estimate made by the writer for the Castner-Kellner process is based on the output and the profits during the seven months ending March 31, 1898, but no allowance has been made for depreciation or losses of mercury.

ESTIMATED COST OF ONE TON 70 PER CENT CAUSTIC SODA AND 2.1 TONS 35 PER CENT BLEACH.

Process.	Cost.	Estimate made by
Richardson & Holland.	$43 25	Leith.....
Hargreaves-Bird.....	42 75	Hargreaves.....
Castner-Kellner.....	49 00*	Kershaw.....
General estimates for any electrolytic process	84 50	Cross & Beavan....
	86 75	Hauserman.....

*Of this total, electrical energy accounts for $16.97, taking the electrical horse-power hour at one-third cent.

The selling value of the above amounts of caustic soda and bleach, at current prices, is $77.50, and the writer estimates that they can be produced by the Le Blanc process for $65.

The Castner-Kellner Alkali Company is now obtaining a price for its bleach $7.50 per ton above the market value, for it has made an arrangement under which the whole of its production, until 1900, is to be taken by the Solvay firm of Brussels at

$29.37 per ton. At present it is therefore making a larger profit on this product than it can hope to make when the contract comes to an end.

The illustrations show the decomposing cells of the first 1,000-horse-power unit of plant at Weston Point. The engines are by Willans & Robinson, they are quick speed, and are coupled to direct-current dynamos built by Mather & Platt. The engines are 250 indicated horse-power, the dynamos are 150 kilowatt machines, and each delivers 1,300 to 1,400 amperes at 110 volts.

For utilization of this electrical energy 250 cells are provided. They are worked in series of 25 cells, each cell being estimated to require four volts. The cells are built of slate, and are 6 feet long × 3 feet broad × 6 inches deep.

In conclusion it may be pointed out that, in comparing the costs of alkali and bleach by the various processes of manufacture, and in forecasting the prospects of the electrolytic processes, it is necessary to make allowance for the sums paid for patent rights. In the Le Blanc process of alkali manufacture all the more important patents have lapsed, and the capital expenditure upon patents may be supposed to have been written off years ago.

The electrolytic processes are, on the other hand, all hampered by the heavy expenditure under this head. The $625,000 paid by the Castner-Kellner Company to the Aluminum Company represents a standing charge of $9.60 upon every one ton of caustic and 2.1 tons of bleach at present produced, and even when the output has reached the maximum of 6,300 tons caustic and 13,600 tons bleach per annum, this charge will still be one-half the above. The position of the electric processes in 10 or 12 years, when the patents have lapsed, will, therefore, be materially improved.—*Electrical Review, London.*

Easy Job for an Electrician.

Here's a chance for an electrician who would like plenty of work between meals. The advertisement is taken from the Glasgow, Scotland, *Herald*, and is published herewith without charge :

ELECTRICAL Engineer and Blacksmith (married) Wanted for a Gentleman's Estate in Scotland ; a man thoroughly experienced in the management and fitting up of electrical plant, and the working of an oil engine ; he must be a good and careful horseshoer, and capable of doing all general blacksmith work required on an estate ; comfortable situation to a good and reliable tradesman ; character must bear the strictest investigation for qualifications and sobriety ; state wages ; good cottage and garden, and five tons of coals per annum ; copies of testimonials and references must be furnished with application for above situation.—Address No. 3377, Glasgow Herald.

The Seneca Falls, N. Y., Electric Light and Power Company's plant has been sold to the General Electric Company for the sum of $10,000.

SCIENTIFIC BREVITIES.

ROTARY CONVERTERS — M. E. DeMarchena, writing in *L'Industrie Electrique*, arrives at the following conclusions regarding rotary converters :

1. There is no advantage in compounding alternators for feeding rotary converters. Alternators with considerable self-induction are suitable for the purpose and will give a minimum wattless current on a line with variable load.

2. When an alternator is compounded to give a constant potential difference between its terminals for all loads, or, when a converter is connected between constant-potential mains, the resistance and self-induction of the transformers and the line will not in general be sufficient, and to avoid excessive currents an inductance must be placed in series with the converter.

3. There is no advantage in determining the excitation of the converter for unit-power factor for full load. It is preferable to annul the wattless currents for a less value of the load, say for 70 or 80 per cent of full load.

These results have been obtained on the assumption that power absorbed by the converter when running light may be neglected.

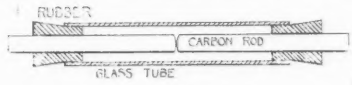
ELECTRICITY AND MUSICAL INSTRUMENTS—In a paper by Mr. C. K. Wead, read before the Philosophical Society, of Washington, some curious facts were stated :

"Electricity is to-day practically applied on a commercial scale to musical instruments in three ways : 1. As a motive power to blow organs and operate self-playing instruments. 2. To operate the pallets of large organs by means of the electro-pneumatic action, patented and introduced by Barker in England in 1868, and shown at the Centennial Exhibition in 1876 by Roosevelt, of New York. 3. To control the application of power to the keys of a piano, the electric circuits being governed by the perforated paper sheet, patented to Seytre in France in 1842 and to Bain in England in 1847.

"Patents have been granted for specific mechanisms for applying electricity to ring bell chimes and play guitars ; to record the music played on a keyboard instrument ; to sustain indefinitely the vibrations of a piano string by impulses from an electro-magnet supplied with an intermittent current of proper frequency, and to produce 'electrical music' by the simultaneous action upon a loud-speaking telephone of several currents of proper pitch and wave-form synthesized in the line-wire."

INDUCTION COIL SPARKS — Our London namesake prints an abstract of Walter's paper on the induction coil spark, originally published in *Wiedemann's Annalen*, that is of great interest. A moving photographic plate was used to record the images of single sparks, and it was found that in each case the ordinary spark consists of a series of three or four discharges, all in the same direction. In a coil giving a spark of about 12 inches, the period of these oscillations was found to be about one-five-thousandths of a second, the total time occupied by the whole spark discharge being about one-one-thousandth of a second. A very curious discovery in connection with these researches is the fact that the spark is not formed at a single leap across the air-gap, but is preceded by several more or less successful attempts to create a path for itself through the dielectric. It seems that these preliminary sparks operate to disassociate the gases in the path and form temporary conducting streaks ; hence it is not strange that all of the several elements which go to make a spark follow precisely the same path.

CARBON COHERERS—In a note presented to the Académie des Sciences by M. Thomas Tommasina, he describes experiments with carbon filings as material for a coherer leading up to



A SIMPLE COHERER.

the construction of a form of instrument that seems to be both sensitive and little liable to derangement. Into the ends of a glass tube about one-half inch in diameter and three inches long pieces of one-fourth-inch electric light carbon are thrust through rubber stoppers, the ends, which are in contact, being rounded. After careful adjustment, which is apt to take some time, the apparatus is said to work admirably and to be little liable to derangement. It is said that a spark one-sixteenth of an inch long between similar carbons without condensers attached is sufficient to cause coherer action. The tube "decoheres" with the least tap, and, if its adjustment is very perfect, immediately upon the cessation of the electric waves without mechanical agitation. The author states that the human body acts perfectly as a gathering conductor for the reception of Hertz waves in place of the usual metallic "wings" which are attached to coherers. From this he concludes that certain deaths by lightning have been due to induced currents generated by a rapidly oscillating flash in the vicinity.

X RAYS IN SURGERY—Major Battersby, of the British Army, has just presented a report to the Roentgen Society, in London, upon experience gained in the use of X rays during the last Soudan campaign. After the battle of Omdurman 121 English wounded were carried to a field hospital, where it was found that, in 21 cases, the bullets could be neither located nor extracted by the usual means. With the assistance of X-ray apparatus they were easily found. Major Battersby thinks that a modified form of influence machine is better for army purposes than a coil. The outfit that was used in the Soudan consisted of a nine-inch coil, condenser, battery of accumulators, interrupter, meters, electric lamps, tubes, etc., the whole being enclosed in an oak box. It was found to be so heavy that it could not be transported by one mule or camel, and it was necessary to put the coil in a separate package, thus making it possible for half of the apparatus to be separated from the other half at the time it was most needed.

AN ELECTRIC WAVE DETECTOR—The foreign journals have recently given much attention to a simple device for detecting electric waves as described by Neugschwender. If a scratch is made in the silver coating of a mirror, so as to divide the coating into two parts insulated from one another, then, of course, no current will pass when the two parts are connected to the terminals of a cell of battery. If the gap in the mirror coating is breathed upon there will be a deposit of moisture and some current flows, which will be detected by a galvanometer in the circuit. Under these conditions, if electric waves are generated in the neighborhood, the galvanometer, if its sensitiveness is not too great, goes back to zero, showing that the impact of the waves has made the resistance of the gap very great. Breathed upon again, the gap becomes conducting, and the galvanometer again shows a deflection. If a damp cloth is laid over the gap so as to maintain a constant supply of moisture, the galvanometer goes back to zero only while the waves are impinging upon the gap. Copper and zinc mirrors work as well as silver, and other good insulating materials may be used instead of glass as a base for them. Instead of water vapor, ammonia and salt solutions may be used with equal success. Mechanical vibrations, sound waves, heat and static electricity seem to have no influence upon the conductivity, but even small sparks have a marked effect. The recuperative action is so rapid that, when a telephone is put into the circuit, the note of a rapid break on the generating coil is reproduced.

Searchlights at Santiago.

The efficiency and importance of the searchlight as a naval auxiliary is made evident by the following quotation (by special permission) from Rear Admiral W. T. Sampson's article, "The Atlantic Fleet in the Spanish War," in the *Century Magazine:*

The searchlight, as will be seen, was a very important factor of the blockade. At first everybody felt that it was desirable to explore the coast on each side of the harbor, and every ship acted for herself, and began in the same way, moving the searchlight up and down the coast. But we found, after one or two trials, that where the beam of one light was intersected by the beam of the next we could see nothing. Moreover, the slightest movement of the pivot of the light made the beam change so rapidly that little could be made out. We therefore restricted the service to a single light at any one time, keeping it stationary and pointed exactly up the harbor, which it illuminated perfectly.

The searchlight service was assigned to the battle-ships "Massachusetts," "Oregon" and "Iowa" and (after her arrival) to the "Indiana," each taking turns of two hours, from dark until the next morning at daybreak. This shift was necessary because of the rapid heating up of the light, and because it was very exacting and fatiguing to the men in charge, so that a light could not long be maintained by a single man, though only the most expert men were employed. The scene on a moderately dark night was a very impressive one, the path of the searchlight having a certain massiveness, and the slopes and crown of the Morro cliff being lighted up with the brilliancy of silver. The lighter vessels, the "Gloucester," "Scorpion," "Suwanee" and "Vixen," were constantly on the lookout on each flank, going in closer at night, ahead of the searchlight but, of course, outside its path. At night, also, two or three launches from the battle-ships were stationed still farther in, near the mouth of the harbor. The vessels all kept their bows pointed to the entrance, and each of the battle-ships was provided with four searchlights, all but the stern light being used in succession, as needed. Every night when the light was to be used a signal to begin was made to the vessel which took the first turn, say at seven o'clock. The first vessel took it for two hours, the other vessels in turn moving up to the position, one light being turned on before the other was turned off. The searchlight service was not abandoned until after the night of the Fourth of July, when at about half-past eleven the "Reina Mercedes" was sunk in the channel near the Morro in an unsuccessful effort to block the channel, the shells of the "Texas" and the "Massachusetts" materially assisting the sinking.

It was a week after my arrival at Santiago before the searchlight service was thoroughly established. Every night, when the ship came up to her position and turned the light on, and I saw the harbor illuminated, I felt entirely secure. I looked at it many times during the night, always with the same feeling; and there it was night after night, with no variation. After we arrived we had the friendly aid of a brilliant moon, and as the moon waned we became very anxious; but after we had the searchlight we reviled the moon, because really we could not see as well with the moon as without it.

Toward the last of June, when we felt sure that Cervera would come out soon if he was coming out at all, an additional precaution was taken by adding to the searchlight ship another battle-ship which kept her broadside up the entrance, ready to open fire, as the vessel illuminating the passage could not have brought her guns to bear without shifting position and throwing off the light.

Speaking of Cervera's strategy, Rear Admiral Sampson says:

When we come to consider the strategy of Admiral Cervera in leaving the harbor, it must be said first of all that it would have been much better, if he could have done so, to leave by night. That he could not do so is the testimony of officers of his fleet. We know from what they said subsequently, while they were prisoners, that this plan had been considered by the admiral and his officers. Two advocated going out by night; the others were all in favor of the sortie by day. The great difficulty in a night attempt was our dazzling searchlight. A searchlight shining direct in one's eyes prevents him absolutely from seeing anything else; it is as though he were looking at the sun; and it was that effect upon them, taken in connection with the necessity of seeing their way out of the channel, that made them hesitate. This feeling was in itself a compliment to the efficiency of the blockade, but we did not attach so much importance to the dazzling of the enemy as to the illumination of the channel so that we could see everything that was going on. It was a continual wonder to us why they did not fire at our searchlight, which was always within range. To be sure, it would have required pretty good marksmanship to knock it out, but it would have made the man who was manipulating it quite uneasy to know that he was the center of the enemy's fire.

The enemy had no searchlights at their defenses. All the necessary machinery was in place for the establishment of one on Socapa, but they never got so far as to complete the plant and actually use it.

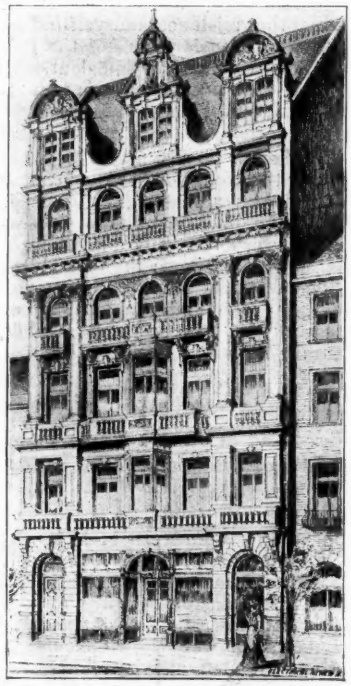
Articles of incorporation have been filed with the Secretary of State by the Seattle & Tacoma, Wash., Electric Railroad Company, with a capital stock of $1,000,000. Prominent Seattle and Tacoma parties are interested in the construction of this road, which will bring Seattle and Tacoma in closer relations.

The New Building of the United River Plate Telephone Company at Buenos Aires.

To the Editor of Electrical Review:

Thinking it may interest you, I send a sketch of the new building erected by the United Telephone Company of the River Plate, in Buenos Aires, upon the Avenida de Mayo, beyond question the finest street in South America, and unsurpassed, it is thought, in any part of the world.

The building has a front elevation of 104 feet, a depth of 150 feet and



The New Telephone Building at Buenos Aires.

width of 50 feet. The two upper stories are occupied by the telephone company, the sixth floor being used in part for the switch-room, where a new multiple board, fitted for 4,200 subscribers, metallic circuits, is being erected by the Western Electric Company.

The building is arranged for stores on its ground floor and for offices above; it is lighted throughout by electricity, and has two Sprague electric power elevators.

It may be considered a fair exponent of the enterprise and progress of Argentina. The company has nearly 8,000 subscribers and will soon pass that number.

Yours truly,
Frank William Jones,
Managing Director.

Buenos Aires, March 2.

A movement is on foot at Columbia, Ky., to build an electric railroad from Columbia to Campbellsville, Ky. Louisville capitalists are interested.

Steam Railways in Cuba.

With commendable enterprise, the *Travelers' Official Railway Guide*, of New York city, has prepared maps, time-tables and lists of officers of the railroad and steamship lines in Cuba. The *Guide* states that there are about 900 miles of road in the railway system which connects with Havana. There are besides about 200 miles of road in Cuba not connected with Havana, making about 1,100 miles of road now in operation in all parts of Cuba. The steamship lines cover the principal cities on the entire coast of the island.

The railroads are provided with telephone or telegraph lines which are in fair working order. The road beds are of good width and well drained, and the main lines are laid with steel rails weighing from 50 to 62 pounds. The cross ties are mostly of the hard woods of the country, and are spaced at the rate of 2,000 to 2,640 to the mile. It is estimated that with an outlay of $6,000 a mile, the Cuban railway system can be put into proper working order to economically handle such business as may be expected with the return of peace and prosperity.

National Electric Light Association.

To the Editor of Electrical Review:

The Trunk Line Association has granted a rate of a fare and one-third, on the certificate plan, from all points in their territory and return, for delegates and friends attending the twenty-second convention of the National Electric Light Association, to be held in New York, May 23, 24, 25. It is expected that the same rate will be granted by the other railway associations at an early date. Yours very truly,

C. O. Baker, Jr.,
Master of Transportation.

New York, April 13.

German Telephone Service.

United States Consul Schumann, writing from Mainz, says:

"The telephone service of this country is a public institution, controlled and managed by the Department for Posts and Telegraphs. The rates are certainly very low, the charge for a local telephone being $38.55 per annum, including the rental of the instrument. The service, however, is lacking in enterprise. I applied on February 20 to have a telephone placed in my residence, and was told that the connection could not possibly be made before May or June, as they did not string wires in Winter."

EXTENSIVE ISOLATED ELECTRIC STATION.

THE ELECTRIC LIGHTING PLANT OF THE PHILADELPHIA CITY HALL.

The municipal buildings of the city of Philadelphia are among the largest of their kind, and the electric lighting plant recently installed in them is of interest to engineers, not only on account of some novel features which it contains, but as well because of its magnitude. The illustrations herewith show one of the generating units and a section of the switchboard. Each of the units—there being three similar sets in operation with two more to be installed—consists of an Ames engine, 18x22 inches, direct-coupled to a 200-kilowatt, 110-volt Westinghouse dynamo. The dynamo-room is located under a portion of the central courtyard of the building, and is partially lighted by ordinary vault lights. This room is very handsomely finished, having a marble floor with tiled walls and ceiling. It is sufficiently large to accommodate the 1,500 horse-power of generating units which later will be installed in it.

The switchboard, which stands out about three feet from the wall, extends along one side of the room, is about 40 feet long by 10 feet high, and comprises 15 panels. These panels are of white Italian marble, finely finished with beveled edges, and bolted by means of bronze bolts to an iron frame. At the top of the board is an ornamental bronze cornice. The dynamo leads are taken to the board through ducts in the floor, and the circuit connections extend from the back of the board also under the floor. Access is had to the back of the board by means of a locked door.

There are two sets of bus-bars, made of flat copper bar and laminated. Of the panels, five are generator panels, nine supply the feeders and one contains the equalizer switches. One of the feeder panels controls the circuit leading to the tower in which the great clock is located. Connected to it are some 600 incandescent lamps, which illuminate the four dials of the clock, and 16 arc lamps, which surround the base of the statue of William Penn at the top. Of the remaining feeder panels, one is devoted to each of the seven floors of the building.

On each of the generator panels is a main dynamo switch and a main circuit-breaker, having a capacity of 2,000 amperes, also an ampere meter reading to 2,000 amperes. Two of the panels carry ordinary switchboard voltmeters, one being connected with the bus-bars, while the other is connected by a voltmeter switch, to any machine when it is desired to cut it into the circuit. On the central panel is located an illuminated dial voltmeter mounted on a bracket and standing at right angles to the board. This instrument has a scale on both faces, so that an attendant at any point of the board is never more than 20 feet from one side of it, at which distance it is easy to make a reading. The equalizer panel contains an ammeter reading to 2,000 amperes, and a triple-pole, single-throw switch, connecting the two sets of bus-bars together. Each of the feeder panels contains eight switches, a 1,200-ampere circuit-breaker, and an ampere-meter reading up to the maximum capacity of the feeders.

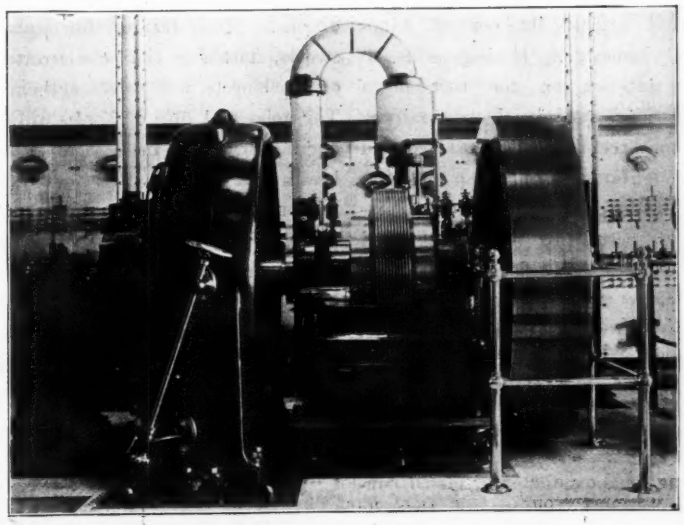


FIG. 1.—ENGINE AND DYNAMO SET IN THE CITY HALL ELECTRIC PLANT, PHILADELPHIA.

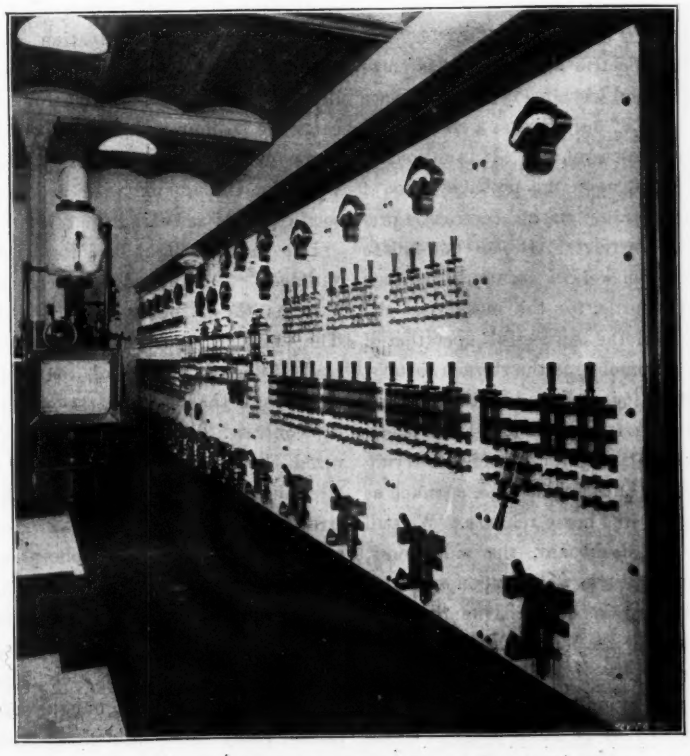


FIG. 2.—SWITCHBOARD IN THE CITY HALL ELECTRIC PLANT, PHILADELPHIA.

The wiring system of the building is unique in some respects. It is laid out on a two-wire system at 110 volts, two volts drop being allowed from the board to the lamps. At each of the corners of the building is a riser, and on each floor are four corresponding sets of feeder mains. By means of tablet boards on the floors these mains can be tied together in almost any combination, so that practically any lamp in the building may be lit from any circuit through a number of arrangements of the tablet board switches. From the center of distribution of each of the lamp circuits pressure wires are led back to the switchboard, and there connected to a potential indicator. The method of regulation is by cutting in or out feeders, the whole system being naturally in parallel, and thus increasing or decreasing the resistance between the board and the point of supply.

The plant was installed under the engineering supervision of Mr. Edward Davis, who planned the arrangement described above. The switchboard was built by F. D. Hazleton, of Philadelphia, who also made the switches. All of the instruments were made by the Keystone Electrical Instrument Company, of Philadelphia, their cases being finished in full copper to match the switchboard trimmings. The plant is one of the largest isolated installations in the country, having a capacity of not less than twenty thousand 16-candle-power lights.

The San Juan Light and Transit Company.

The San Juan Light and Transit Company, of New York city, was incorporated at Albany, N. Y., on April 15, with a capital of $500,000, to furnish electricity in Porto Rico, to operate gas plants, waterworks, telegraph and telephone lines, mines, hotels, theaters, ice plants and express service, and to acquire property rights and franchises necessary for the proper conduct of its business. Its directors are Philip H. McMilan, J. J. Kennedy, Russell B. Merchant, W. H. Spurge and Robert Seager, of New York city.

Another New York Telephone Company.

A charter was granted at Charleston, W. Va., on April 14, to the People's Telephone Company, of New York city. The capital subscribed is $2,000, which may be increased to $5,000,000. The shareholders are A. Wilford Hall, George Fruck, Oscar F. Shaw, Duane P. Cobb and Frank W. Hubby, Jr., all of New York city.

Electrical Review

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There seems to be a feeling in municipal circles that the trolley wire must go. In a few cities the conduit has replaced it, or, rather, has been constructed in streets where the trolley wire would not be allowed. However satisfactory in operation this system may be, its great cost has worked against its general adoption. Indeed, it is impossible to earn interest on the cost of a high-class conduit electric-railway system except in the most crowded thoroughfares. The cheap and simple trolley system, with its flexibility, permitting extensions and changes to be quickly and easily made, has won almost universal favor in the United States. But it must be admitted that it is a crude system—one that has no right to exist after a better one is proved practicable. It is for these reasons that there has been so much activity among inventors of sectional conductor or closed conduit systems. If one of these is successful it will occupy the middle ground between the costly and satisfactory conduit and the cheap, but ugly, trolley. It is a little too early to predict the future of such systems, but it seems likely that a successful, practical, service demonstration of one of them would do much to hasten the disappearance of the trolley wire.

THE ELECTRIC VEHICLE.

The electric automobile has come to stay, and has already taken its place in some of our cities as a rival of the horse-drawn vehicle. It is curious to speculate upon the probable effect of the introduction of electrically propelled carriages. It can not fail to put the makers of accumulators upon their mettle, for the most vital element in the successful operation of the automobile is the storage battery.

It must introduce into the carriage-building trade new ideas. It is evident that, as yet, designers are trying to make automobiles look as much as possible like horse vehicles. We still see the dashboard, the side doors, even the little railing upon which to rest the reins. It is true that one may still see, in an English railway carriage, the lines of the stage coach of our grandfathers. But we are supposed to be more progressive to-day—especially in the United States—and it is to be hoped that, some day, automobiles will be designed with reference to their uses and method of propulsion—not in deference to an ancient tradition.

The most important work the self-moving vehicle will accomplish will be the betterment of municipal conditions. The demand for asphalt streets, started by the popularization of the bicycle, will be strengthened. The noise and filth of horses will be eliminated, to the increase of public health and comfort. The house fly, bred in stables, will be only an unpleasant memory. The cleanliness of city streets will be enormously enhanced, and the horse—will he be banished? It is to be hoped that twentieth century civilization will answer yes, certainly in so far as cities are concerned.

ELECTRIC STREET LIGHTING SYSTEMS.

The first really extensive application of electric lighting was for the illumination of streets and outdoor places. The great intrinsic brilliancy of the arc light, the intense illumination of the immediate vicinity of a lamp, and the color of the light, which approached more nearly to daylight than the familiar gas, all appealed to popular imagination and contributed to the vogue of the new illuminant. In fact, arc lighting became the fashion, and, in the United States at least, a town whose streets were not illuminated with arcs was soon regarded as behind the times.

But the new light had its disadvantages. The shadows were as dark as the lit places were bright. The very intensity of the light made the darkness of outlying streets and shaded spots the greater by contrast. It was soon recognized that the true function of a street-lighting system is to light the streets—not to dazzle the eyes of men and horses. From this conception arose the idea of tower lighting. High skeleton towers were erected in many cities and crowned with a group of arcs. The effect was a more general distribution of light, but the only places really well lighted by this system were the house-tops. Tree-shadows made places of cavernous gloom, while streets having relatively high buildings—generally the most important streets—were lighted only by towers that happened to be directly in their line.

With the perfection of the incandescent lamp came its application to street lighting, it being thought that here was the solution of the problem of diffused light. But, unfortunately, the light looked like gas and cost very much more per unit of intensity than the arc. It was not possible to produce with it the areas of brilliant illumination that surround an arc; it did not look so satisfying to eyes accustomed to the glare of the familiar corner lamp. For these reasons the incandescent light has never become popular as a street illuminant.

In our larger cities there are extensive systems of conductors for constant-potential current distribution, and the lately introduced long-burning enclosed arc lamps work with great satisfaction on these circuits. These lamps can be made in fairly small light units, and by using incandescent lamps in place of the usual resistance required in connection with them show a considerable efficiency. As they require trimming only once in about two weeks, on the average, and as they can be worked from existing two-wire or three-wire circuits, they seem to promise excellently. They can not, however, be used on alternating circuits with entire satisfaction.

Remembering that street lighting requires a general distribution of illumination, that there is a popular demand for units of high luminous intensity, and that efficiency is an absolute requisite, it seems that we must look to improvements in the arc lamp—or, possibly, to lamps similar to that just brought out by Dr. Nernst—for any great improvement in street lighting systems. The series arc lamp introduces difficulties of high voltage when large and efficient dynamos are used with it, the incandescent lamp is unsatisfactory, the direct-current enclosed arc requires the installation of much copper, the Nernst lamp is still in the laboratory stage. Here is a promising field for the inventor and engineer. The system that gives the most and best distributed light at a reasonable cost is sure to meet with general adoption.

A Few Pertinent Electrical Suggestions.

To the Editor of Electrical Review:

Replying to the inquiry you forwarded, regarding harmonizing amperes and watts, I am afraid it is up to you or C. to send a learned dissertation on the subject. To be perfectly honest with you, I have never attempted to harmonize them. I simply send them out over the same wire with a few equalized volts and let them fight it out in their own fashion. I notice, however, that the watts always succeed in bringing the volts and amperes into effective combination in obtaining some useful work from the combination. You might explain that the old plan of having one wire to carry the amperes and another wire to carry the watts is no longer considered good engineering practice.

Really it is a consolation to see a letter of this sort, for it shows that other concerns besides our own receive idiotic communications. Up to date I thought we were the only ones who received such letters.

Have a letter in hand asking how to run a telephone exchange, and inquiring for an instrument to "measure short-circuits." Suggestions will be appreciated.

Permit me to congratulate you on the rapid strides the Electrical Review is making, and accept my best wishes for its continued prosperity.

Philadelphia, April 12. S.

Colonel Pope and Automobiles.

The Boston *News Bureau* understands that Col. Albert A. Pope has incorporated the Columbia Electric Vehicle Company with a capital of $3,000,000, but that he is likely to become the manufacturer for the electric vehicle companies recently organized by the Philadelphia storage battery interest, instead of their competitors in the operation of electric automobiles. In fact, we hear, says the paper quoted, that Mr. Pope has been offered a $3,000,000 contract for the construction of electric automobiles for the New England Electric Vehicle Company and allied concerns.

Mrs. Bertha Ayrton, wife of Prof. W. E. Ayrton, F. R. S., the eminent electrician and physicist, enjoys the distinction of being the first lady to read a paper before the British Institute of Electrical Engineers. Her subject was "Hissing of the Electric Arc."

Wall Street and the Electrical Stock Market.

The stocks which were the worst sufferers in last week's collapse experienced an entire recovery during the present week, affording a new illustration of the fact that the current speculative era is a very remarkable one. The bank statement issued to-day was especially favorable, and caused a slight rise all along the line. As compared with the final prices of last Saturday, the entire stock list closed the week at higher figures.

On the New York exchange General Electric closed to-day at 116¾ bid and 116⅞ asked, a gain of ⅞ point for the week. Metropolitan Street Railway, of New York, closed at 252¼ bid and 253 asked, a gain of 4 points for the week. Third Avenue Railroad, of New York, closed at 224½ bid and 227 asked, a gain of 1 point for the week.

On the Boston exchange American Bell Telephone closed at 361 bid and no asked price, a gain of 8 points for the week. Erie Telephone closed at 91 bid and 93 asked.

On the Philadelphia exchange Electric Storage Battery common closed at 188 bid and 190 asked, a gain of 3 points for the week. Union Traction closed at 43⅞ bid and 44 asked, a rise of 3 points for the week.

On the curb or outside market in New York Electric Vehicle closed at 136 bid and 137 asked, a loss of 8 points for the week. Electric Boat closed at 35 bid and 36 asked, a rise of 1 point for the week.

Wall Street, April 15.

A Brooklyn Wedding of Note.

Mr. G. Herbert Potter, well known in the lithographing business in New York city, and Miss Ethel May Candee, of Brooklyn, daughter of Capt. Willard L. Candee, of the Okonite company, were married at the Church of the Messiah, April 4. The ceremony was particularly impressive, and the church was full to overflowing with friends of the bridal couple. A very enjoyable and brilliant reception was held later in the evening at the famous Pouch Mansion, in Brooklyn, where the happy and popular young couple received the congratulations of a great number of friends. The wedding was the social event of the season in the City of Churches, and a very elaborate and brilliant affair throughout. Mr. and Mrs. Potter enjoyed their honeymoon at the Hotel Chamberlain, Old Point Comfort, and will be at home in Brooklyn to their friends after May next.

PERSONAL.

Gen. E. S. Greeley, of New Haven, Ct., the well known electrical pioneer, is spending the week in New York city.

Prof. Henry S. Carhart, of the department of physics of the University of Michigan, has been granted a year's leave of absence.

Dr. S. S. Wheeler, president of the Crocker-Wheeler Electric Company, recently returned to New York city from a visit to Havana.

Mr. Geo. J. Jackson, secretary of the National Conduit and Cable Company, has returned to New York city, after a short absence in Europe.

Mr. W. A. Stadelman, New York manager for the Brown Hoisting and Conveying Machine Company, of Cleveland, Ohio, returned last week from Yucatan, after a month's trip in the tropics.

Mr. David Young, vice-president of the North Jersey Street Railway, has been appointed receiver of the New Jersey Electric Railroad, to succeed William B. Gouley, who resigned in order to take position as president of the Brooklyn & Coney Island Road.

Mr. Henry D. Lyman, a telephone pioneer who is well known in electrical circles, has been elected president of the American Surety Company, of New York, with which he has been connected for a number of years, latterly as vice president and general manager.

The new directors of the Nassau Electric Railroad Company, of Brooklyn, N.Y., have elected these officers: Clinton L. Rossiter, president; Hugh J. Grant, vice president, and Col. T. S. Williams, secretary and treasurer. The management of the Nassau road is now identical with that of the Brooklyn Rapid Transit Company.

Mr. W. J. Clarke, general manager of the General Electric Company's foreign department, sailed on the "Etruria" last Saturday. Mr. Clarke will remain abroad four months to complete the organization of his department, and to superintend the installation of General Electric apparatus on the London, Bristol and Dublin tramways.

At the last meeting of the Société Internationale des Electriciens, Professor Mascart was elected president for the ensuing term, which will cover the period of the exposition of 1900. The society, which is the representative French electro-technical body, is to be congratulated upon its choice, as Professor Mascart unites with his distinguished ability the greatest personal popularity.

WHO CAN NAME IT?

The electrically propelled, self-contained vehicle for roads and streets lacks a name. Since its appearance as a familiar object in the streets it has been saddled with a variety of designations, some too long, some meaningless, all unsatisfactory. Here are some samples:

Accumobile,	Electrobat,
Autocar,	Electrobug,
Automobile,	Electrocycle,
Automotor,	Horseless Carriage,
Autobain,	Motocar,
Electric Automobile,	Motocycle,
" Cab,	Motor cab,
" Carriage,	Motor car,
" Vehicle,	Motor cycle,
" Wagon,	Whizzer.

In order that this last development of electrical engineering shall no longer suffer under many *aliases*, the Electrical Review has determined to offer prizes for the best name for it, and invites its readers to compete. Anybody can enter the lists, and all suggestions will be welcomed. Names should be sent, by mail or otherwise, to the Name Committee, care the Electrical Review, 41 Park row, New York. From time to time the list of names received will be published. The contest will close on May 27, and the names of the winners, together with the designations selected, will be announced in the issue of May 31.

The following prizes are offered:

First prize, $10 and one year's subscription to the Electrical Review.

Second prize, $5 and one year's subscription to the Electrical Review.

Third prize, one year's subscription to the Electrical Review.

The names submitted will be carefully considered by a committee composed of Dr. Louis Duncan, chief engineer of the Third Avenue Railway Company; Mr. J. J. Carty, chief engineer of the New York Telephone Company, and Mr. Charles Blizard, New York Manager of the Electric Storage Battery Company. Communications will be numbered in the order in which they are received, and in case of duplication of the winning names the prize will be given to the sender of that first received.

The Ohio Valley Telephone Company is preparing to open an exchange at Corydon, Ind., and another at Cloverport, Ky. These will be in operation in a short time. The old line was condemned and will be abandoned. The new metallic circuit to Cloverport is now up and from there connections are being made with Owensboro, Henderson and other points. The line west of Cloverport is built and in operation.

Municipal Trading.

A correspondent of the Pittsburgh *Times* writes as follows under date of January 11:

The Sunday issue of the Pittsburgh *Post* contains an editorial reprint of the substance of an erroneous statement made by W. E. Curtis relative to the new departure the municipality of Manchester is making in the destructive fad of municipal trading. The editorial opens with the statement that "municipal socialism is making extraordinary progress in Manchester, Eng. It has just made a new departure by adding manufactories of soap, tallow, oil, glue and fertilizers to its garbage and sewer department;" and then continues on in that strain without one word of editorial comment or explanation showing how due allowance should be made for any statements made by Mr. Curtis, or how destructive to all that tends to enrich and broaden a municipality's scope and function is the fad of municipal socialism.

Mr. Curtis realizes that this expensive fad of municipal paternalism is going to be an important factor in the coming elections in certain states, and that the newspaper correspondent who can write most entertainingly on the subject, even though he deals not in facts, will find the largest circle of readers—among those who never pay taxes.

England has made many costly experiments with municipal ownership during the past 20 years, yet competent observers report that her public service functions are of a character that would not be tolerated in any progressive American village, owing either to the antiquated equipment in use, or to the obsolete methods employed. And this criticism bears deeply on the telephone service, the street railway service and the electric lighting service, as well as on the methods employed in street cleaning, etc. For instance, Chelmsford, with a population of 15,000, is said to pay $110 a year for each arc lamp of 2,000 candle-power, burning 3,687 hours; Newport pays $125, Londonderry $120, and Kingston $100, which indicates that English municipalities are far more liberal in making public-service contracts than are the officials of American towns of similar population. In certain English towns the municipality is operating its own electric lighting plant, but finds by experience that the rate of depreciation is so much greater than was calculated that the cost per light per year equals or exceeds the rate charged by the local lighting company.

Now the remedy certain interested promoters propose to apply to this degenerative state of affairs is to have these English municipalities enter into the manufacture and sale of electrical apparatus, to the end that the equipment in each local plant may always be up to date. Could any proposition be more ridiculous? On the score of protecting the health as well as the purse of the resident, a municipality might find some justification for entering into the business of the baker, the butcher and the dairyman. But that each municipality should engage in the manufacture and sale of electrical apparatus!

That the promoters of this illogical scheme of "municipal trading" are advancing plausible arguments acceptable to that class of voters who rarely reason a question to its logical conclusion, and who are never called upon to pay taxes, is evidenced by the tenor of the resolutions passed at an important meeting of representative officials from many municipalities held in Manchester last month. After thoroughly discussing the question of "municipal trading," it was resolved "that this conference of municipal corporations protests against the same as violating the principles for which municipal corporations have in past years successfully contended."

Again, a prominent English editor wrote: "The essential principle of municipalization, viz., the owning and working of commercial undertakings by municipal authorities, may not be essentially evil; indeed, it is one of the dangerous features of this later-day development that in its theoretical or text-book presentation it appears so feasible and as tending so highly to the public good. But in actual every-day life the working of commercial undertakings by local authorities, too often composed of ignorant and entirely self-interested individuals, has often been attended by grievous evils, injurious to the interests of the general public and often tyrannizing over one or more sections of that public. Between the ideal and actual in fact there would appear to be a wide gulf, the bridging over of which is a task that gives no sign of being accomplished."

At another meeting of gentlemen of such commercial standing that political leaders of the prominence of England's attorney-general and Mr. John Burns, men of opposite views, deemed it well worth their while to participate in the debate, it was clearly stated that "England's resources are simply frittered away by meddlesome busy-bodies. Municipalism ought to spell progress; as it is, it simply spells another kind of individualism."

Commenting on the proceedings of this and similar meetings, an English journal editorially remarks: "It appears that some 71 municipalities desire to engage in the manufacture of dynamos, electric lamps, and electric appliances, and to acquire or purchase patent rights over the same. . . . In fact, taxpayers would become the involuntary stockholders in a practically unlimited liability company, the changing directors over the same depending very much for guidance on their own officials." And Dr. J. A. Fleming, the well known and honored English professor, says: "The strongest argument of all, however, against municipal trading is that it would destroy the stimulus to continual invention and improvement which springs from the incessant rivalry due to free and open competition. The private manufacturing firm which does not advance with the time dies. The manufacturing municipality would probably find its greatest safety in going slow."

LITERARY.

The executive work done by Maj.-Gen. Leonard Wood at Santiago is considered one of the great achievements of the army. General Wood has written for the May *Scribner's* a straightforward and modest account of what he has accomplished as practical dictator in making over the whole state of Santiago on the lines of modern civilization. This is the only article of any kind written by General Wood. It is an account of our first successful experiment in colonial government from the highest authority, the chief executive of the province.

Electric Storage Battery Directors.

The expected resignation from members of the Electric Storage Battery Board and the entrance of the new interests were made at a meeting held in Philadelphia on April 12. P. A. B. Widener, Wm. L. Elkins, Geo. A. Huhn and three representatives of the Whitney contingent, including Mr. Whitney's private secretary, were elected to the board. Those of the old members who remained in the board are W. W. Gibbs, Geo. S. Philler, Isaac L. Rice, Rudolph Ellis, Joseph S. Sinnott, General Manager Lloyd and W. D. Winsor. Mr. Rice continues in the presidency for the present. The general offices of the company are to remain in Philadelphia, and a new plant, in addition to the one in this city, is to be established in New York.

A Lighting Kink.

One of the difficult problems of carrying on manufacturing operations is sometimes to get sufficient light at a certain spot, such as upon the die of a drawing press where work must be accurately placed and very quickly handled. A light placed close to the die is often impossible, because it would be in the way or for some other reason. Hans Renold, of Manchester, Eng., gets over the difficulty, says the *American Machinist*, by placing behind and above one of the overhead incandescent lamps a small mirror in such position that the beam of light reflected from it falls directly upon the spot to be illuminated. Thus a strong light is secured just where it is wanted, the lamp is out of the way, contributes better to the general lighting of the shop, and the operator feels no heat from it.

Dr. St. Clair McKelway on Modern Journalism.

At a meeting of the Sphinx Club, at the Waldorf-Astoria, New York city, on April 12, Dr. St. Clair McKelway, editor of the Brooklyn *Eagle*, said among other things:

"Advertisers and newspaper men together make the character of a public journal. The editorial page, all contradiction to the contrary notwithstanding, is the most important page of the newspaper. The news pages, by their fairness, their cleanness, their intelligence and their enterprise, largely make evident the ability and the resources of the sheet. But the editorial page reflects not only the ability, but the character of the journal; its virtue as well as its vigor; its conscience as well as its capacity; its courage as well as its conscience. The editorial page indicates the quality of the constituency of a newspaper. I know that it could not get along without the news pages, but I also know that the news pages would get along in limping and halting fashion without the editorial page. Recall newspapers with poor editorial pages or with none, but with bright news pages. They may have vogue, but they do not have influence. They may have circulation, but they do not have power. They may be able to say things and to spread things, but they can not do things and can not get things done. And the exact measure of their impotency is suggested by the blare of their claims of efficiency and of accomplishment. Happily these newspapers of blare are just few enough to be as distinctive as repulsive, and desirably to differentiate themselves from the general journalism that, at home and abroad, was never more respectable and more honored than it is to-day."

The Sphinx Club is an association of men engaged in the advertising business or any of its allied interests. Mr. Artemas Ward is president and Mr. F. James Gibson is secretary of the club.

E. S. Folwell, of Newark, N. J., was arrested the other day, at the instigation of the People's Electric Light and Power Company, of that city, who charged him with stealing current by means of an illicit switch placed between the transformer and the meter. It is alleged that he had diverted current worth $499 between August 31 of last year and April 10. A number of similar devices have been discovered in Newark and the officers of the company are trying to catch and convict a man who winks and then offers to put in a "regulator" for a small sum of money.

Some New Electric Automobiles.

We illustrate herewith three new types of electric automobiles, and also the mechanical and electrical construction of a vehicle designed for a delivery wagon. These automobiles embody a number of new features in this field of electric application. One of the characteristics which will appeal to those who have studied this line of development is that the batteries are contained within the body or under the seat of the vehicles. The manufacturer, the General Electric Automobile Company, of Philadelphia, owns the rights for the series-parallel controller for automobiles, and, through this important privilege, is able to accomplish the most perfect control as to speed in its vehicles. One objection heretofore has been that in congested streets these vehicles were obliged to come to a full stop, then go on for a short distance, not being able to run at a low and constant speed. With the series-parallel controller these carriages can be operated at a steady speed up to any desired rapidity, within certain limitations. The storage battery used is one which has been developed by the engineers connected with this company. The officers of the company state that the battery has features which make it possible to get the greatest power with the least weight. The plates are opened interiorly, which give them a very large surface of contact for the battery elements. They are three-thirty-seconds of an inch in thickness and, as the gases of the elements at all impaired. For a runabout, or light delivery wagon, the General Electric Automobile Company say that their battery equipment known as No. 2, weighing about 500 pounds, develops excellent results. This battery is 26 by 12 by 28 inches. For heavy delivery wagons or broughams battery No. 3, weighing 720 pounds, is a success. The size of this battery is 36 by 12 by 28 inches.

This company, which has large offices in the Philadelphia Bourse Building and a well equipped factory on North Second street in the same city, has recently been reorganized, and is planning to develop its automobiles to a large degree. It is said that it now controls by ownership 70 patents, covering many practical devices and appliances of value, for the construction of electrically-propelled vehicles. These include many fundamental or basic patents for electric railway cars and electric car lighting by secondary batteries, storage batteries or accumulators. It is the intention to apply all these patent privileges to the construction of these vehicles.

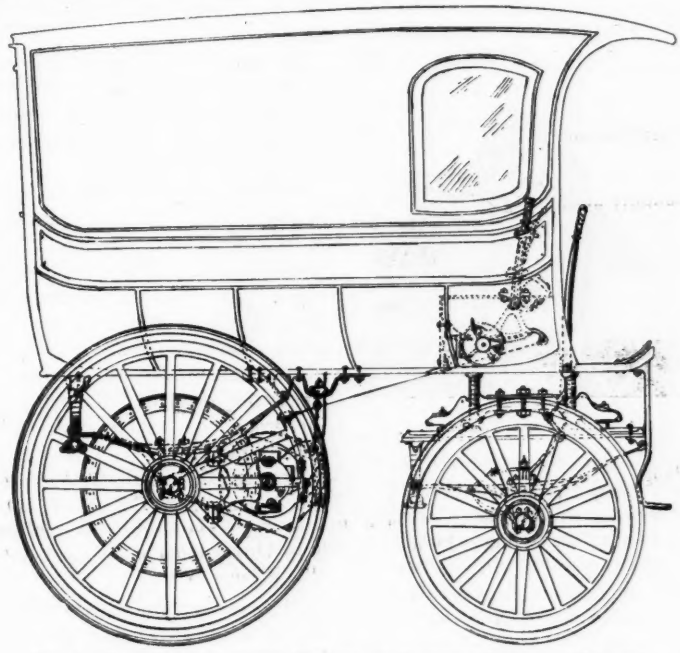


FIG. 1.—SIDE ELEVATION AND DETAILS OF ELECTRIC DELIVERY WAGON.

FIG. 2.—TYPES OF ELECTRIC AUTOMOBILES AND DELIVERY WAGON.

are said to penetrate only to the extent of one one-hundredth of an inch into these plates, it is claimed that one-third more surface is exposed than in other types of storage batteries, and that the lasting qualities are not

General Electric Company's Annual Meeting.

The annual meeting of the stockholders of the General Electric Company will be held at the company's office in Schenectady, N. Y., on Tuesday, May 9, 1899, at 12 o'clock, noon, for the election of directors for the ensuing year and for the transaction of any other business which may properly come before the meeting. The stock transfer books were closed on April 12, and will remain closed until May 10.

Dr. Gustav Wiedemann.

Germany has lost one of its hardest workers in the realms of pure physics by the death of Prof. G. H. Wiedemann. He was one of those who pursued the study of science in the true spirit of an investigator, out of pure love of his self-imposed tasks, leaving to others the work of applying the results of scientific progress to industrial problems. Dr. Wiedemann is best known as editor of the *Annalen der Physik und Chemie*, more commonly known since 1887 as *Wiedemann's Annalen*. This journal has always been the principal organ by means of which the research work of German scientists has been published to the world, ranking on an equal footing with the official publications of the Royal Society in Great Britain and of the Académie des Sciences in France.

Gustav Heinrich Wiedemann was born in Berlin on October 2, 1826, and was the son of a wholesale merchant. He was educated at the Berlin Gymnasium, and at the age of 18 he became a student of the Berlin University. Here he had the good fortune to be admitted to the private laboratory of Magnus. In 1847 he took his degree, and two years later he published an account of his first electrical researches into the conducting power of crystals. Other valuable work followed on the magnetic rotation of the plane of polarization, on electrical endosmose and on the coincidence of the conductibility of metals for heat and electricity, the last having been in conjunction with W. Franz. Soon after his marriage with the eldest daughter of the celebrated chemist, Eilhard Mitscherlich, he was appointed in 1854 to a professorship at the University of Basle, and thence he moved in 1863 to the technical high school at Brunswick, and in 1866 to Karlsruhe. It was in 1871 that he came to the University of Leipsic, where he remained until his death. He was first appointed professor of physical chemistry, but in 1887 he exchanged this professorial chair for the professorship of physics. His death will be deplored by scientific men of all countries.

Gas and Electric Fixture Combination.

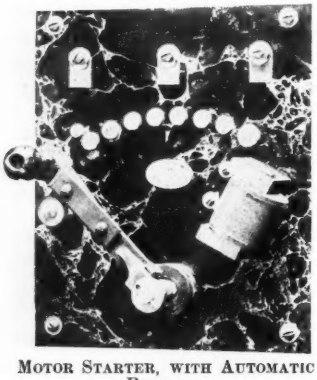
Announcement was made in New York city, on April 13, of the formation of the American Gas and Electric Lighting Fixture Company, with a capitalization of $6,000,000, to consolidate the leading manufacturers of electric and gas lighting appliances, including the Mitchell Vance company and the Archer & Pancoast company.

Motor Starter with Automatic Release.

It often happens that the supply of current from the central station or isolated plant is cut off and then suddenly turned on again. If the armature of a motor is in circuit, this sudden rush of current through it will be attended with disastrous results, often even destroying the armature. The Cutler-Hammer Manufacturing Company, of Chicago, has designed a device, illustrated herewith, which will protect the motor against the disastrous effects of this sudden rush of current.

The automatic device is so arranged that when the current is broken a little magnet, which holds the lever in the "full on" position, becomes demagnetized and allows the lever to fly back to its "full off" position. When the main current is again started, no current will then flow through the armature until the attendant moves the lever over the series of contacts, starting the motor gradually as usual.

The magnet, moreover, is connected in series with the field of the motor and will thus protect the armature, if by any accident the field circuit should become broken. The resistance of this magnet is so small



MOTOR STARTER, WITH AUTOMATIC RELEASE.

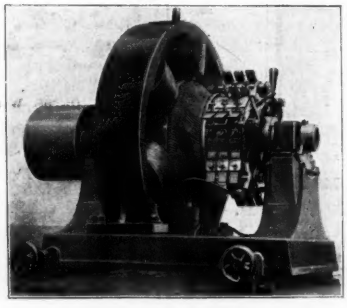
that it has no effect whatever in weakening the field. It consumes but two watts of energy in our one-half to three horse-power sizes, and has a range adapted to motors which use anywhere from one to five per cent in the shunt-field circuit.

The lever is provided with a spring in the hub, tending to keep the lever in the "full off" position, and making it impossible to carelessly leave the lever turned partly over the segments and burn out the rheostat.

The power plant of the Butte, Mont., General Electric Company has been destroyed by fire at a loss estimated at from $30,000 to $50,000.

Multipolar Dynamos and Motors.

The multipolar machine illustrated herewith is an example of modern design, embodying no great novelty of construction, but built in accordance with the best practice, in a symmetrical and compact fashion, for hard and continuous work. The field-magnet ring is a single casting, the coils



SIX-POLE DYNAMO OR MOTOR.

being separately wound and held in place by the pole shoes, which are properly shaped to distribute the magnetic flux. Self-oiling bearings are used, the bearing surfaces being of bronze and liberally supplied with oil from ample reservoirs below through the agency of oiling rings. The armature is of the slotted variety, with large ventilating apertures, the insulation of the slots and mechanical and electrical balance of the whole armature being points that receive particular attention.

Both commutator and brush-holders are large and substantial, their design being such as to admit of continuous and heavy work without interruption or delay. These machines are built in four and six-pole types, in sizes from five to 50 kilowatts, by the Quaker City Electric Company, of Philadelphia.

COPPER-STEEL—A new metal, denominated "copper-steel," has been brought out in Paris. It is described as possessing a very high resistance, and can be forged like iron. It is manufactured by a process during which zinc or its alloys is employed for retaining a certain proportion of iron, nickel, or chromium in the form of oxide, and reducing and incorporating it in a state of fine division in the presence of furnace gases. A number of new alloys, it is stated, are thus obtained, and among them the metal referred to under the title designated.—*Industries and Iron.*

The largest separate electric lighting plant in Chicago has been installed in the Great Northern Hotel. The plant will furnish power for 20,000 incandescent and arc lights for the hotel, theater and office building.

A School for Motormen.

The Metropolitan Street Railway Company, of New York, has inaugurated a training school for would-be motormen, where they are instructed in the arts of handling the controller and brake, emergency repairs, etc.

No "green hand" goes forth these days to get his first instruction from an experienced motorman, who stands behind him on the front platform and tells him how to act.

Such an instructor has been known to say, after a cigar or so purchased at the candidate's expense: "Say, young fellow, I guess you'll do all right. I'll report that you're O. K." The effects of such a system were often disastrous, for the neophyte might run a car into a switch or smash the wagon of some well meaning grocer the first time he walked his own platform.

Through the efforts of the dean of the Metropolitan College of Motormen, the "green hand" experiments with phantom switches and grocers' wagons.

The new motorman is a different man from his predecessor, the "green hand" of a few years ago. He is generally intelligent, for he has to be so, in order to understand the construction of the modern underground trolley car.

He must be able to gage the strength of the current, to detect when a fuse is blown, to act promptly in case of accident and emergency, and even to make temporary repairs to the vehicle over which he has control. He must know everything about his car, so that he may report if there is any defect in the working of its electrical equipment.

The first instruction given the new men is in the 88 rules for the guidance of motormen.

Around three sides of the big loft occupied by the school, at Seventh avenue and Fiftieth street, are dummy front platforms. Here are the dashboard, the brake, the controller and all things which pertain to the front platform of a well ordered trolley car.

The instructor, Mr. Kane, stands in the center of the room and gives the usual bell signals by ringing a gong. The forms of running at slow and high speeds, reversing, emergency stops, coasting, replacing blown fuses, etc., are gone through with, and the men closely watched to see that they instantly obey the signals.

Regular demonstrations are given every day, by means of a skeleton car, in which all the wiring and power equipment is exposed. There are also recitations in the rules, the men being required to have them "letter perfect" after a certain number of days of study.

Three days are given to this kind of instruction, says the New York *Herald*. The beginner presents himself at the college every morning and recites five rules. After that he is sent out on a car with one of the old hands, who calls his attention to important crossings, transfer stations and numerous other details. The beginner is supposed to have already mastered the mechanism of the levers and brake. By constantly running over the lines he gradually becomes familiar with the points at which he must be cautious about stopping. He soon learns where he can speed a little and where he must go very slowly.

He is permitted to take a car of his own on the twentieth day. The dean of the college boards that car in the guise of a passenger, makes his way to the front seat and watches the unsuspecting motorman. If Mr. Kane is finally satisfied he makes out a certificate, and the green motorman is placed on the pay-roll.

Lectures are given every Friday night. This is a post-graduate course, and the men who are anxious to advance to the grade of inspector never lose an opportunity for post-graduate study.

Each man's record is carefully kept. If a complaint is made against him, he is placed on trial. His first offense, unless it is an act of the most flagrant kind, goes unpunished. His second offense means the execution of the sentence suspended in the first case. This system was introduced by H. H. Vreeland, the president of the company.

Heavy Damages.

A verdict for $8,000 has been awarded to Edward G. Wittleder, aged 10 years, by a jury in the Supreme Court, Brooklyn, N. Y., against the Citizens' Electric Light Company. Wittleder took hold of one of the defendant's electric light wires, which was stretched along the platform of the St. Mark's avenue station of the Fifth Avenue Elevated Railroad on July 8, 1898, and received injuries necessitating the amputation of his thumb and two fingers on his right hand. Through his father, Edward G. Wittleder, of 88 Fifth avenue, he sued for $30,000.

Trial of the Safety Third-Rail Electric Company's System.

At Manhattan Beach, on April 12, a public trial of the sectional conductor system of the Safety Third-Rail Electric Company was given in the presence of about 400 invited guests. The experimental track, about three-quarters of a mile long, was equipped with a sectional middle rail, and one car was operated upon it in a very satisfactory manner.

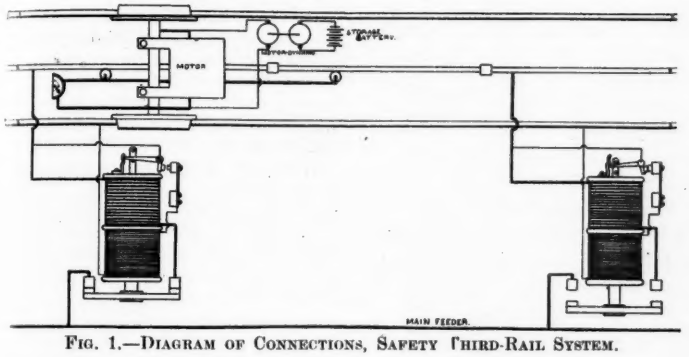


FIG. 1.—DIAGRAM OF CONNECTIONS, SAFETY THIRD-RAIL SYSTEM.

In all systems of this character the underlying principle is that only a short section of the conductor rail—generally that lying directly under the car—shall be "alive," or in connection with the feeder system. The sections of the working conductor are, then, to be automatically connected to and disconnected from the feeders, and no less than 500 United States patents have been issued to cover different methods of accomplishing this end.

Leaving out of account those systems in which mechanical means are used (none of them having proved practicable), and examining the electro-magnetic systems, in which the switches are operated by the current itself, it appears that there are two main classes. One of these requires two conductor rails and the other only one. All of them require some auxiliary device on the car to operate the switches when the main current is turned off.

The system which is here described is of the single conductor rail class, and is the invention of Capt. J. McL. Murphy. The diagram of connections shows its method of operation very clearly.

The car is supplied with a source of electro-motive force equal to the line voltage, which is usually 500 volts. This source of current is a motor-dynamo, which takes current from a few cells of storage battery and transforms it to the full-line potential.

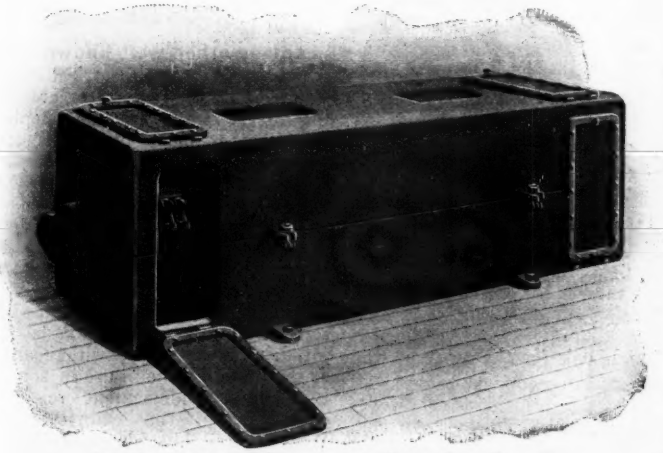


FIG. 2.—MOTOR-DYNAMO, SAFETY THIRD-RAIL SYSTEM.

Each sectional rail is connected to a solenoidal switch which has two windings, one of low resistance and another of high resistance. The former is normally opened and the latter is normally closed, connecting its circuit between the sectional rail and the ground.

Assume the car to be over a rail and ready to start. The switch being open there is no connection between the feeder and the car, which therefore can receive no current. The motorman operates the controller and thereby connects the motor-dynamo to the third rail and to the ground, and current passes through the fine wire of the switch and causes it to operate. In response to this current the plunger rises and first makes contact between the main feeder and the rail, and then breaks the current of the fine wire winding. The controller is now open, and current comes from the feeder through the coarse wire winding of the switch to the third rail and thence through the car motor to ground, causing the car to move. The switch is held shut because of this current in the coarse wire winding. In this closed condition the switch will remain as long as the car is taking current from the section to which the switch is connected. When the car leaves the section there is no longer any current passing through the switch feeding it and it falls open; first, breaking the circuit between the feeder and the sectional rail, and second, restoring the circuit from the sectional rail through the fine wire to earth. The switch is then ready for the next car. The car being thus started, the motor-dynamo is no longer needed to operate the switches, because the car is provided with two sets of shoes which are connected together and placed sufficiently far apart to span the distance from section to section. The forward shoe, as it enters on a section, subjects it to the full-line potential, drawing its source of current from the rail preceding; for the main feeder has already been connected thereto in the manner just described. Once started, therefore, the car becomes independent of the motor-dynamo, for it uses the power-house current to operate the switches.

It will be noted that the switch remains closed until the car ceases to take current from the section it controls. It will then fall open from lack of current to hold it up and there is then no current to break and hence no arc at the switch jaws, and it is therefore a non-arcing switch.

One side of the motor-dynamo is connected across the motor terminals, and ordinarily receives current therefrom, acting as a motor and driving the low-potential side as a dynamo charging 10 small storage cells. If, however, the line current fails, the sides of the motor-dynamo exchange functions, and the high-potential side, now a dynamo, supplies current to operate the switches and light the car. This happens only occasionally, and hence the duty on the storage cells is light, they requiring only casual attention after being once installed.

The switches, which are installed in groups in vaults accessible by manholes, are of simple and solid construction. The solenoid is iron-clad, insuring high efficiency, great lifting power and protection for the coils. The plunger falls by gravity when the current ceases, there being no springs about the apparatus. It is claimed that the Murphy system is not affected by leakage, and that it is impossible for leakage currents to hold up the switches and thus cause a section of the third-rail to be "alive."

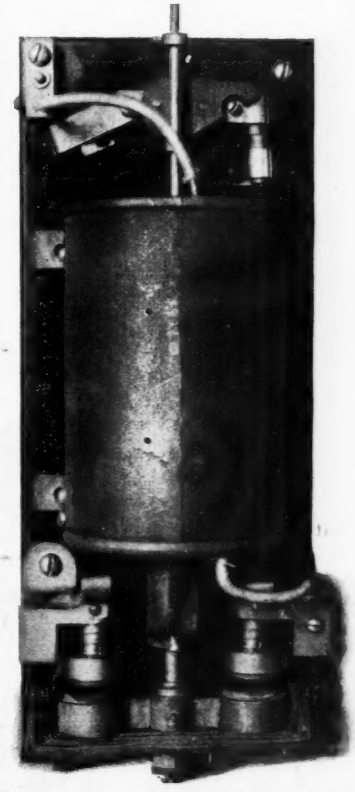


FIG. 3.—ELECTRO-MAGNETIC SWITCH, SAFETY THIRD-RAIL SYSTEM.

After the exhibition of the system at Manhattan Beach a very elaborate luncheon was served to guests of the company. Three special trains were requisite to convey the party to and from Manhattan Beach.

Trolley Wire Thieves.

Thieves raided the line of the Newark & Hackensack Traction Company, on Ridge road, near Rutherford, N. J., on April 13, and cut away 700 feet of feeder wire. The thieves were not caught.

A Novel Battery Recharging Idea.

A simple battery recharging outfit, illustrated herewith in Fig. 1, has been designed for use with the line of portable electric lamps, being widely introduced by the United States Battery Company, of New York. The outfit consists of a current tap socket, marked No. 1 in the illustration; a battery charging tap, No. 3; a recharging wire, Nos. 4 and 5, and a small booklet of litmus paper. The method of recharging is to remove, from an ordinary Edison circuit, an incandescent lamp and put the current tap in place, replacing the lamp; remove the small incandescent bulb from the lamp reflector, and put in place the battery charging tap. When

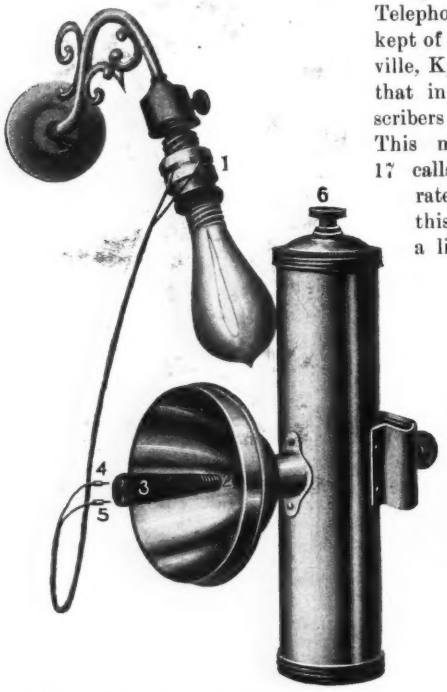


FIG. 1.—RECHARGING OUTFIT FOR PORTABLE STORAGE BATTERY LAMPS.

FIGS. 2, 3 AND 4.—EXAMPLES OF PORTABLE STORAGE BATTERY LAMPS.

the current has been turned on, the end of wire that discolors the moistened litmus paper indicates the negative pole, and must be inserted in the hole marked in tap and the other end in hole marked X. If the proper connections have been made the large incandescent lamp will light, and the recharging of the battery commences, which, in order to obtain a full charge, should be continued for four hours. A full charge in the battery should give from eight to 12 hours' service.

We also illustrate herewith three new styles of these lamps, in addition to those previously shown.

Mr. Fred A. Larkin, New York manager for the E. P. Allis Company, of Milwaukee, returned to New York city last week, after a hasty European business trip.

ITEMS OF INTEREST.

The Cincinnati Street Railway Company has erected its own plant and will build its own cars; the capacity will be sufficiently increased to take orders form other corporations also.

The survey of the proposed route of the Albany, N. Y., Helderberg & Schoharie Electric Railway has been about completed, and it is expected that the work of construction will be begun in a few weeks. The State Board of Railway Commissioners has granted the application of the company to increase its capital stock from $300,000 to $1,250,000, which will allow the rapid completion of the road.

Captain Gifford, of the Ohio Valley Telephone Company, had a record kept of the telephone calls in Louisville, Ky., the other day, and found that in 24 hours over 50,000 subscribers or callers used the lines. This makes an average of over 17 calls per instrument. At the rate paid, $6.50 per month, this would give an average of a little over one cent per call.

They do things in an original way in Chicago. During the reconstruction of an office building there it became necessary to cut through a group of half-a-dozen 15-inch steel I-beams.

Owing to the difficulty of getting at the beams at the places where they were to be cut, special saws would have been required had the beams been cut in the ordinary way, and it was estimated that the work would take two men about 12 days' time and cost about $100.

Instead of doing the work with hack saws, a current of electricity was brought in from the electric lighting wires in the street to do the work. The positive terminal wire was attached to the steel frame work of the building, to which the beams were riveted, and the negative wire was attached to a carbon point one and one-half inches in diameter, which was provided with a wooden handle to enable the operator to direct it along the beams at the places where they were to be cut. An asbestos shield protected the operator's body from the heat and black spectacles protected his eyes. In 12 hours the beams were severed, with an expenditure of only about five horse-power in electric current.

BOOK NOTICES.

"Small Accumulators"—By Percival Marshall. Published by Spon & Chamberlain, New York. Price, 50 cents. Supplied by the Electrical Review Publishing Company, Times Building, New York. This little volume is a practical treatise on storage batteries, giving explicit instructions for making several sizes of experimental accumulators. A few pages of useful receipts and memoranda make the small volume, which is attractively bound in cloth, a valuable hand-book for the amateur who is interested in secondary batteries.

"John Sherman's Recollections of Forty Years in the House, Senate and Country." An Autobiography. By The Werner Company, Dayton, Ohio.

This is an interesting historical review given by one of the most distinguished men of the United States. While the book is, naturally, from the point of view of the distinguished official, it is quite comprehensive and, to the student of political history, will be found invaluable. It begins with the ancestry of the Sherman family, and covers the political history of the United States for 40 years, ending with the year 1890. The book is in two volumes.

General Electric Company Doing a Great Business.

The business of the General Electric Company affords a striking example of the revival of prosperity in American manufacturing enterprises. Since January 1 the foreign business of the company has increased more than 100 per cent over the same period last year. This branch alone will aggregate $4,000,000 for the current year. Last year the total business was at the rate of $1,500,000 per month. So far this year it is at the rate of nearly $2,000,000 per month. Among recent contracts are two for the Bristol and London tramways, amounting to over $500,000, and a mail order from the Metropolitan Street Railway Company, of New York city, for $300,000 of apparatus. All departments at Schenectady are working night and day, and orders are said to be six months ahead of the capacity of the works.

It is officially stated that the company's business for the first two weeks in April is the largest in its history, aggregating $2,000,000.

INDUSTRIAL NOTES.

The partnership existing between R. L. Whitman and Sam'l H. Couch, constituting the firm of Whitman & Couch, of Boston, makers of telephone apparatus, has been dissolved by mutual consent. The entire plant has been taken over by the newly organized firm of the Couch & Seeley Company. The company announces that, "with increased facilities and continued effort to produce apparatus of the highest only, we purpose to maintain the reputation already established for our product."

Among other well known goods which the Western Electrical Supply Company, of St. Louis, Mo., are offering to the trade are the telephone switchboards made by the Western Telephone Construction Company. The Western Electrical Supply Company have only recently taken the agency for this board, but have, however, due to their usual enterprise, made an excellent start and anticipate a very large demand owing to the long established and well deserved reputation this switchboard has enjoyed. The Western switchboard is at the present time in use in some of the largest independent telephone exchanges in the country. The Western switchboards are fully covered by broad patents controlled by the Western Telephone Construction Company, and their numerous points of merit have, judging from the number of boards in use, met with universal favor throughout the country. The Western Electrical Supply Company claim that this switchboard is not only holding its own but making very rapid strides to the front in the large field of competition, in which they come in contact with numerous varieties of switchboards.

The Western Electrical Supply Company will be pleased to furnish estimates on this switchboard to any one anticipating the installation of a telephone exchange.

CHICAGO ELECTRICAL TRADE NEWS.

The Victor Electric Company, 418–20 Dearborn street, Chicago, are manufacturers of the "Victor dry cells" for telephone and all open-circuit work. The company claim to have in this cell the effective combination of strength, constancy and durability, and are meeting with many sales. They will send to all battery users who buy in large quantities a sample for trial, free of charge.

The Chicago General Fixture Company, 169 Adams street, Chicago, carry in stock at all times a full line of electrical supplies for the trade. They also have a very large stock of electrical, combination and gas fixtures, of which they make a specialty. They also issue a regular monthly bulletin, giving in detail to their customers a full list of the supplies for construction and other work carried in stock. Their catalogues will be mailed free on application.

Holyoke & Holyoke, of Chicago, Ill., manufacturers of the H. & H. telephone switchboard, telephone hooks, arms and parts, are now located in a new factory at the southeast corner of Van Buren and Clinton streets, where they will be better able to handle satisfactorily their growing business. They also make a line of induction, repeating and spark coils and special coils for all electrical work; make a specialty of repairing and guarantee their output.

The Siemens & Halske Electric Company are making extensive improvements in their factory in Chicago, and are putting into the plant a considerable amount of new machinery which will greatly increase their manufacturing facilities. They have recently shipped to the Mexican International Railroad at Ciudad Porforio Diaz, Mex., three large Siemens & Halske generators and 12 motors, to be used in the new machine shops of the above-mentioned road.

The Chicago Edison Company of Chicago, Ill., have one of the most complete shops in the West for the repairs of electrical machinery. The demand for electrical machinery which has been in service for some time and is taken out and put in first-class condition by expert workmen is fast becoming a trade in itself, and in this way an excellent machine is sometimes bought at a low figure. This company issue regular bulletins of their stock on hand taken out of their own plants, and therefore know their history. F. E. C.

Prof. R. W. Wood.

Prof. R. W. Wood, of the University of Wisconsin, whose interesting experiments upon the photography of sound-waves were described in the ELECTRICAL REVIEW recently, is also the originator of the ingenious electrical method for thawing frozen water-pipes. Born in Concord, Mass., in 1868, Professor Wood graduated from Harvard and became fellow in chemistry of the University of Chicago. Before his connection with the University of Wisconsin, in 1897, he studied abroad, taking a course in physics in the University of Berlin. His recent work has been mainly in optics and electricity, along which lines he is now conducting interesting and important researches.

PROF. R. W. WOOD.

Non-Resident Lecturers at the University of Minnesota.

Mr. N. H. Gray, electrical engineer and contractor, of Minneapolis, lectured to the students of the College of Engineering on March 14 upon "Gasoline Engines for Small Electric Light Plants." His experience leads him to prefer the "hit and miss" type rather than those that take an explosion at every stroke. The regulation of these engines has been improved so far that no trouble is now experienced from flickering of the lights, at least with engines of 25 or more horse-power. The engine is still capable of being improved, the main journals being generally too small to carry the weight of the immense balance wheels without risk of sudden and serious "hot boxes." The other principal weakness of the gasoline engine is its liability to refuse to start, the reasons being frequently difficult to locate and remove quickly. In a number of plants he had installed the gasoline engines were working satisfactorily. The best field for them is in remote places, where transportation is so expensive that gasolene can easily compete with more bulky and heavy fuels. The control of the gasolene market by a trust is the principal source of uncertainty in the use of such fuel.

Mr. Channing T. Gage, of the American Steel and Wire Company, lectured on March 23 upon "The Manufacture of Copper Wire," describing the interesting processes of mining and reducing the ore, following the copper through the ingot to the rod and the wire. He described a number of processes of insulating wires of various brands, showing the proper uses of each and illustrating by a number of samples.

Prof. Morgan Brooks, of the University of Nebraska, lectured on March 30 upon "Finance and Engineering," showing how the reduced rates of interest now current are affecting the engineering industries. The lower cost of money enables works to be undertaken that promise only a comparatively low, but sure, return. The same fact, together with the more conservative methods now used in exploiting electric plants as compared with some extravagant practices of early days, renders available for engineering enterprises much capital that formerly was reserved for more sure and orthodox lines of activity. It also affects the character of engineering construction, the American practice approaching more and more the substantial character of that in older countries, where money is plenty and draws only low interest. The increased recent use of the storage battery may be attributed partly, at least, to this influence. This also emphasizes the necessity of reducing operating expenses and makes desirable the introduction of labor-saving devices and other economies, since a given amount of wages or money spent for coal represents the earning capacity of a larger amount of capital.

In the near future, Mr. J. T. Fanning, hydraulic and consulting engineer of Minneapolis, will lecture upon the "History and Development of Water-Power." On April 28, Mr. Walter B. Snow, of the Sturdevant Blower Company, Boston, will lecture upon "The Influence of Mechanical Draught Upon the Ultimate Efficiency of Steam Boilers."

Hamilton, Canada, is discussing a municipal plant to be operated by current from the Cataract Power Company.

New Electrical Directories.

The E. L. Powers Company, publishers, 150 Nassau street, New York city, announce that they propose to publish quarterly directories covering every branch of the electrical business. Mr. E. L. Powers is president and treasurer of the company, Mr. E. L. Blanchard, vice-president, and Mr. W. F. Hanks, secretary and business manager. All these gentlemen are well known in the electrical field, and they have had considerable experience in directory work.

The E. L. Powers Company has purchased *Johnston's Electrical and Street Railway Directory*, formerly published by the W. J. Johnston Company. The data of central electric lighting stations will be incorporated with and appear in the *American Electrical Directory*, which, as heretofore, will be published quarterly. A list of street railways will be published in the *American Street Railway Directory*, which is also issued four times a year. A directory of isolated lighting plants will be issued separately, at least once a year. The telephone exchanges will be covered in a separate publication.

The plan under which the directories are to be issued is entirely original, and the publishers announce that no effort or expense will be spared to bring the information thoroughly up to date, and keep it so. They will no doubt receive the prompt and cordial cooperation of every one interested in the welfare of the electrical business.

High Speeds on Steam Railway Mail Trains.

In the recent record-breaking runs made by the fast mail trains over the lines of the Chicago, Burlington & Quincy and the Chicago & Northwestern railroads, Cleveland Moffett, as special representative and correspondent of *McClure's Magazine*, made the trip from "start to finish." Full details of the round trip, from Chicago to Omaha, which is the most recent, and at the same time in many respects, and for many reasons, the most interesting and exciting "race against time" ever made in this country, are vividly described as they actually presented themselves to the writer, who rode in the cab by the side of the engineer, whose hand on the throttle controlled the engine on this most remarkable "record-breaking" run. This article, which appears in *McClure's Magazine* for April, will be replete with illustrations and pen pictures.

ELECTRIC LIGHT FLASHES.

Orillia, Canada, proposes to erect a municipal power plant at a cost of $100,000 at Ragged Rapids. This town has a municipal lighting plant of its own, but it proposes to sell power as well.

The Seneca Light and Power Company's property, at Seneca Falls and Waterloo, N. Y., has been sold at foreclosure. James A. Van Voast, attorney for the General Electric Company, bid in the property for $10,000.

The plant of the Muscatine, Iowa, Electric Light and Power Company, operating the street railway, electric light and gas plants in that city, has been sold to Harry Huttig, general manager of the Huttig Brothers Manufacturing Company. The plant is valued at $300,000.

At the annual meeting of the stockholders of the Edison Electric Light Company of Altoona, Ill., the following directors were elected: H. C. Dern, S. H. Smith, John Lloyd, A J. Anderson, C. A. Wood, H. E. Ferguson. The new board organized by electing the following officers: President, H. C. Dern; vice-president, S. H. Smith; secretary, A. J. Anderson. C. A. Wood and H. E. Ferguson were appointed an auditing committee.

A certificate of consolidation of the East Chester Gas Light Company, the Pelham Gas Light Company, the Westchester Gas and Electric Comany and the Larchmont Gas Company, under the title of the New York Suburban Gas Company, has been filed with the Secretary of State. The capital stock is $1,500,000. The principal offices of the company will be in Mount Vernon, N. Y. The directors are William Carpenter, Francis Crawley and Edmund Penfold, of New York city; Eugene Vanderpool, of Newark, N. J., and E. H. McCullough, of Philadelphia.

The Philmont & Claverack, N. Y., Electric Light and Power Company has been incorporated, with a capital of $10,000, to furnish electric light to the villages of Philmont, Mellenville and Claverack, in Columbia County. The directors are Harry Bates, of Rensselaer; Frank G. Simmons, of Hudson; Ben H. Denison, of Berlin; Charles H. Gardner, of Troy, and Frank Gardner, of North Adams. The officers of the company are: President, Harry Bates; vice-president, Frank G. Simmons; secretary, Ben H. Denison; treasurer, Charles H. Gardner; civil engineer and general manager, Frank Gardner.

Mr. C. S. Knight, the New Manager of the Siemens-Halske Company.

The Siemens-Halske Electric Company of America has elected, as its vice-president and general manager, one of the best known electrical men in the country, Mr. C. S. Knight. He has already entered upon his new duties in the company's general offices in Chicago.

The appointment of Mr. Knight is the inauguration of a new and vigorous business policy on the part of his company, which, while it has been doing a quite extensive business and steadily making itself felt in the quality of its products, has not endeavored to secure business to any great extent outside of certain lines. It has the use, in America, of all the data, patents and patterns owned by the parent company in Berlin, which has the most extensive electrical works in the world, and which also stands high in the quality of its products. It is one of the cardinal principles of the home company never to allow a piece of apparatus to go onto the market until it has been tested in private to an extent which warrants the makers to absolutely guarantee what it will do. Hence the name Siemens-Halske has long since become a synonym for good work. The sales department has been reorganized, and includes some of the strongest men in the country. Certainly no better selection could have been made for general manager.

MR. C. S. KNIGHT.

Mr. Knight was born at Columbus, Ohio, and passed his early life there; he entered the service of what are now the Pennsylvania lines west of Pittsburgh in 1860, and continued in the transportation department of the railroad until 1881. After this he was for five years engaged in the gas business at Fort Wayne, Ind.; at the end of that period Mr. Knight became interested in the Fort Wayne Electric Company. When this company was thrown into the hands of a receiver in June, 1894, and the Fort Wayne Electric Corporation organized for the purpose of operating the business under contract with the receiver, Mr. Knight was chosen a director of the new concern. This connection continued until February 1 of this year, when he resigned the vice presidency of the corporation. He is a broad, progressive man, with a very wide acquaintance in the electrical and street railway field, and has hosts of friends, all of whom will wish him a full measure of success in his new work.

Electric Railway Notes from Washington, D. C.

Urban communication for Washington promises to be very largely developed within the next year or two. Suburban roads have been projected or are in course of construction in various directions, intended mainly to open up the rich gardening and trucking regions surrounding the city and to provide quick transit to a ready market.

The Chesapeake Beach Railroad will soon be in operation, connecting Bennings, Marlboro and Hyattsville with Washington. Steam is now used on that portion in operation, but electricity will be substituted, and this line will reach the city via the Columbia Railway Company's extension or the Bennings road.

A similar plan is under way to connect Rockville, Md., by an extension of the Georgetown & Tennallytown line, and capitalists have ventured on another undertaking to connect the Sandy Spring, Md., region with Washington. Commissioner Beach has expressed the opinion that it is against good public policy to allow electric roads within the city to carry freight. It is not anticipated, however, that such action by the Commission as that expressed by Mr. Beach will have any effect on roads operating without the city's gates, though still within the district.

The House Bill No. 10,667, authorizing the consolidation of the various lines purchased by O. T. Crosby and his associates, to be known as the Washington City Railway, provides, among other things, that, in lieu of a personal tax on its rolling stock, tracks and overhead construction, each of the railways operating in the District of Columbia shall pay into the District treasury each year four per cent of its gross earnings, from whatever source, providing that its real estate (excluding cars and street equipments) be taxed as other real estate.

Telephone News .....and Comment

It is reported that Williamsport, Pa., will have a new independent telephone exchange to be completed by next Summer.

The Kinloch Telephone Company, of St. Louis, has been deeded over to the Mississippi Valley Trust Company, in trust, to secure an issue of $1,400,000 bonds.

The Central Union Telephone Company is reported to be giving free telephone service at Crawfordsville, Ind., in competition with the Home Telephone Company.

The People's Telephone Company, of Wilkes Barre, Pa., will soon begin laying wires under ground on the central streets. The company expects to have the lines open for business on July 1.

The City Hall and opera house, together with the adjoining building, occupied by the Postal Telegraph Company, of Columbia, S. C., have been destroyed by fire. The aggregate loss is about $70,000, with $35,550 insurance.

It is reported that the extensive system of telephone toll lines in Ohio owned by the National Telephone and Telegraph Company has passed into the hands of another corporation, which owns independent lines in that state, the United States Telephone Company. Several hundred miles of lines are involved in the deal.

The recently incorporated Frederick County, Md., Telephone and Telegraph Company, through its authorized representatives, Col. D. C. Winebrener, Wm. P. Maulsby, James E. Walker and Dr. P. D. Fahrney, has purchased the interest of the Interstate Telephone and Telegraph Company in Frederick County for the consideration of $20,000.

The increase for March and the first quarter of 1899 of the three principal companies, licensees of the American Bell, show gains as follows: In March Central Union gained 1,474 subscribers; Pacific Coast, 1,875; Erie system, 4,025; three combined, 7,374. The quarterly gain was: Central Union, 3,908; Pacific Coast, 5,195, and Erie system, 9,908 subscribers. Of net gain for March shown by Erie system, 1,366 were in Michigan, and it is stated that the company had 1,500 subscribers to connect April 1, not included in any of the above figures.

Cable-Cutting in the American-Spanish War.

In his article on "The Atlantic Fleet in the Spanish War" in the *Century Magazine*, Rear Admiral W. T. Sampson pays especial attention to cable-cutting operations. By special permission we quote as follows:

"Even before the declaration of war, preparations were made by the Navy Department to cut the submarine cables of Cuba, permission being obtained from the Western Union Telegraph Company to install on board one of our ships a set of grapneling apparatus belonging to them, which was stored at Key West.

"As the water off the ports where the telegraph cables were to be destroyed was very deep, varying from a few hundred fathoms to several thousand, it was necessary that the grapneling outfit should be strong enough to lift 1,000 fathoms of cable, or, if working in shoaler water, the cutting ship must work close under the shore and be exposed to fire. As all the cables are on the south side of the island, where we were not at the time prepared to blockade or to defend the grapneling ship, it was necessary to send a sufficient force to fight wherever it might be necessary. For this reason Captain Taylor, of the 'Indiana,' was put in charge of the duty, with a considerable force.

"A curious cable system had grown up in Cuba, owing to the insecurity of the land-lines. The Spaniards had learned from experience that only a submarine telegraph was secure against destruction by the Cubans. The poor insurgents had not the means of reaching the submarine cables, for the Spaniards occupied the towns and cities where the ends of the cables were landed; but the land-lines on the south side were always at their mercy.

"From Batabano on the west to Guantanamo on the east the towns were connected by submarine cables, and in some cases more than one cable was employed. To destroy all connection with the outside world was difficult. There were four cables from Santiago de Cuba to Jamaica, and one from Guantanamo to Santo Domingo; then there was the Key West cable to Havana, over which frequent, if not constant, communication was held during the whole war.

"It was by this last route that we were first informed, on May 19, that Cervera's fleet had reached Santiago, and each day for several days afterward that it was still there. This service reconciled me to the continuance of this cable. At first I regarded the news with suspicion, as it came direct from Havana; but its daily repetition at the same hour, and the mysterious hints as to its reliability from such men as Colonel Allen of the signal service, who had been appointed censor at the Key West end of the Havana cable, won my confidence.

"The following details concerning the reception of this news are from a private letter to me from one who was then at Key West:

"The entrance of the fleet into the harbor was made known to the writer within an hour thereafter, and almost immediately coded and wired to Washington, and confirmations of the fleet being (remaining) there were received daily, and occasionally coded and wired to Washington. The manner of getting information of importance from Havana had previously been arranged for by me. The party who sent me such information was an employé of the (cable) company, and assumed much greater risk than I cared to have him do, for the reason that he let another employé into the secret, who watched and reported to me during his absence. Fortunately, our cables were being worked 'duplex,' which made it possible for such news to be transmitted without detection. All this news about the fleet came from Santiago to the captain-general at Havana over the Cuba submarine cable, and was told to my agent by a Spanish government official holding a high position."

"Following is a résumé of the cable-cutting undertaken or accomplished by our vessels:

"May 11, 'Marblehead' and 'Nashville' cut two cables at Cienfuegos, under a galling fire.

"May 18, 'St. Louis' and 'Wompatuck' cut a cable at Santiago.

"May 19, 'St. Louis' and 'Wompatuck' unsuccessfully attempted to cut Guantanamo cable

"June 7, 'St. Louis' and 'Marblehead' cut Guantanamo cable.

"June 19, 'St. Louis' reported by signal that cable from Santiago to Jamaica had been cut.

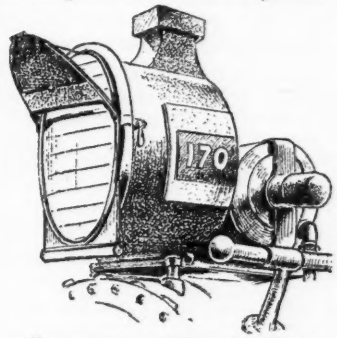
"July 21, 'Wilmington,' 'Helena,' 'Manning' and 'Hist' cut Jucaro-Tunas cable, a local one between Manzanillo and Cienfuegos."

Southwestern Gas, Electric and Street Railway Association.

The date of the annual convention of this association, which was to have been held at Austin, Tex., on April 19, has been postponed to May 17.

A Double-Ray Electric Headlight.

Experiments have been made, on a locomotive running between Cincinnati and Indianapolis, with a new form of electric headlight, the invention of Mr. E. A. Edwards, of Cincinnati. A compact steam-driven dynamo is

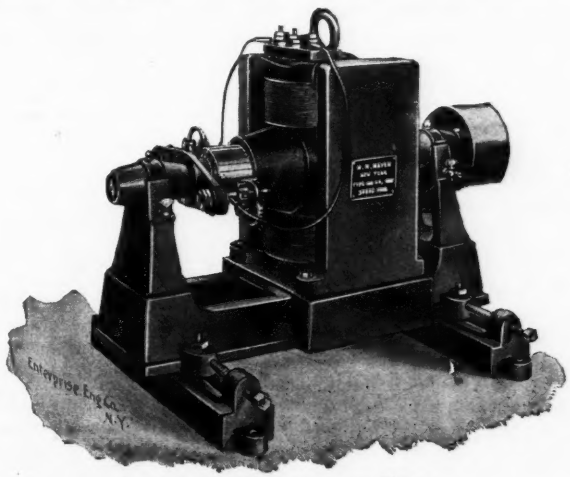


HORIZONTAL AND VERTICAL BEAM ELECTRIC HEADLIGHT.

mounted on the forward end of the locomotive boiler and supplies current to the arc lamp projector of the headlight. In front of the upper third of the projector is a plane mirror, inclined at an angle of 45 degrees, which reflects a powerful beam of light vertically upwards. This, it is claimed, is visible at a great distance, and indicates the approximate position of a locomotive approaching from any direction.

Improved Types of Dynamos and Motors.

The illustration herewith shows the type of a line of improved direct-current dynamos and motors, made by



IMPROVED TYPE DYNAMO AND MOTOR.

the Maxwell M. Mayer Electric Company, New York. The machines are of the two-pole, ironclad type, the whole magnetic circuit being a single, open-hearth steel casting. This is bolted to a cast-iron base, which also carries the pillow-block supports. These are bored at the same time as the pole-pieces, securing in this way the correct alignment of the bearings. The field coils are separately wound on metal spools. In the armature a slotted drum core is used, and mica insulation is employed throughout. Tempered copper commutators of large size and bearing surface and carbon brushes are used. These machines are built in sizes of one, two, three and five horse-power, and are constructed for hard and heavy service.

A Record Price for Zinc Ore.

A press dispatch from Joplin, Mo., says that zinc ore made another world's record on April 13, selling at $51.50 per ton. Still higher prices are predicted, as good zinc properties are in great demand.

A New Incandescent Lamp Company.

The Incandescent Light Company, with a capital stock of $2,000,000, has been incorporated at Trenton, N. J. The company will manufacture and deal in gas and electric lamps. Henry A. Morton, Charles A. Dickey, Charles D. Burrage and Kenneth McLaren, all of Jersey City, are the incorporators.

Carbons from Sulphuric Acid Rock.

A prominent carbon manufacturing company recently found in its mail the following interesting letter:

1899

Dear Sir i would like to know if you make carbons out of selfluric asid rock if so how mutch is it worth i have found the rock on my farm and the watter shoes the same i was told that your company could inform me weather it was eny good or not

Yours respectfully

A—— B——

Greater America Exposition, Omaha.

The grounds of the Greater America Exposition at Omaha are being transformed into veritable tropical gardens. Palm-trees, foliage plants, shrubs and the flora of the tropics will be transplanted in the beautiful bluffs tract and in the grand court on either side of the lagoon—an area of not less than 140 acres. There will be acres of machinery in active operation in the great buildings of the Greater America Exposition at Omaha this year An infinite variety of products will be manufactured on the grounds. A sum approximating $2,000,000 was expended on the buildings and grounds of the Greater America Exposition at Omaha.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

CHESTER, ILL.—The Gordon Telephone Company has completed the extension of its line from this place to New Palestine, and the connection is now in perfect working order.

LITTLE ROCK, ARK.—The Batesville & Winnerva Telephone Company has been incorporated. The officers are E. C. Cook, Sr., president; John A. Cockrum, vice-president; E. A. Farris, secretary and treasurer. The capital stock is $25,000.

OWINGSVILLE, KY.—The stock necessary for building and operating a telephone line from this place to Sherburne, Fleming County, has been subscribed.

SALIDA, COLO.—The Salida Telephone and Telegraph Company, with a capital of $12,000, has been incorporated. The purpose of the new company is to establish and operate a telephone system in the city, and to purchase or construct telegraph lines that will complete a system of magnetic telegraph with present termini at Buena Vista, Salida and White Horn, all in Chaffee County. A provision is made permitting operation in any other county in the state. Messrs. G. F. Stodghill, J. W. Deweese and S. W. Sandusky, of Colorado, and Thomas Stodghill, of Iowa, are the incorporators.

READING, PA.—The Pennsylvania Telephone Company will shortly extend its line to Strausstown, Rehrersburg and Millersburg. At present it only reaches Schaefferstown.

BIG STONE GAP, VA.—The Virginia Telephone Company has been incorporated; capital, $5,000; incorporators, C. C. Cochran, S. R. Cochran, R. T. Irvine, J. F. Bullitt, R. P. Barron, all of Big Stone Gap.

ZANESVILLE, OHIO—The Zanesville Telephone and Telegraph Company has organized by electing the following officers: President, S. M. Winn; vice-president, J. G. England; treasurer, A. T. Brennan; secretary and general manager, J. B. Rhodes.

CASTILE, N. Y.—The Castile & Silver Springs Telephone Company has been reorganized into the Wyoming County Telephone Company, and has been incorporated under the laws of the state of New York to operate a telephone line connecting Castile, Gainesville, Perry, Pike, Portageville, Rock Glen, Silver Springs and Warsaw, in Wyoming County; Nunda, Mount Morris and Dalton, in Livingston County. The capital stock is $2,000. The directors are Miles A. Hopkins, D. E. Van Arsdale, E. B. Windsor, C. M. Johnson, J. S. Chapman, of Castile, and F. T. Dudley and N. H. Lewis, of Silver Springs. At a meeting of the directors M. A. Hopkins was elected president; E. B. Windsor, secretary, and D. E. Van Arsdale, treasurer.

NEW PAYNESVILLE, MINN.—Steps are being taken for the organization of the Western Stearns Telephone Company, a corporation for the purpose of building a telephone line from this village to connect with a number of the smaller villages in this county. The headquarters of the corporation will be in this village.

Electric Light and Power.

TULLAHONA, TENN. — G. W. Steagall has purchased the Tullahoma electric light plant from F. B. Martin, and will operate it in the future. The plant has been greatly improved lately.

WILLIAMSTOWN, PA.—The citizens of this place are discussing the advisability of erecting an electric lighting plant.

CANTON, PA.—The Canton Illuminating Company has been incorporated; capital, $12,000; incorporators, L. R. Gleason, H. L. Clark, J. F. Clark, W. V. Bacom, W. C. Sechrist, all of Canton; Emma M. Lewis, Washington, Pa.

WHEELING, W. VA.—The Consumers' Electric Company has been incorporated; capital, $500,000; incorporators, John E. Wright, W. C. Hanlan, Samuel W. Harper, Jas. Steadman, Geo. E. House, all of Wheeling.

CAMDEN, N. J. — The Fishers Island Electric Light, Heat and Power Company has been incorporated; capital, $10,000; incorporators, E. M. Ferguson, Robert Linderman, Garret B. Linderman, Walton Ferguson, Henry Gordon.

MISHAWKA, IND. — The Indiana Heat and Light Company has been incorporated; capital, $5,000,000; incorporators, George T. E. Lym, R. F. Atkins, J. W. Malcolm, Henry Martin, all of Charleston, W. Va.

LINNEUS, MO.—An electric light plant is to be established here.

New Incorporations.

EAST ORANGE, N. J.—The American Roller Bearing Company has been incorporated. The company will do all sorts of business connected with mechanical and electrical engineering on a capital stock of $1,000,000. William B. Lambert, George W. Hastings, Frederick Hall, Myron F. Hill and Henry W. Gillett, incorporators.

NEW YORK, N. Y.—The Columbia Electrical Supply Company has been incorporated; capital, $500,000; incorporators, S. C. McPherson, No. 201 Monroe street, New York; Wm. H. White, Jr., No. 424 East 116th street, New York; Thomas P. McGlynn, Harry W. Barkley, Montclair, N. J.

SPRINGFIELD, MO.—The Craig & Craig Company, electric fixtures; capital, $15,000; incorporators, Bertram J. Craig, Stedman W. Craig, Alfred W. Gardiner.

PORTLAND, ME. — The Chase-Shawmut Company has been organized for the purpose of manufacturing and dealing in all kinds of electrical, chemical and mechanical machinery, etc., with $500,000 capital stock. The officers are: President, Charles Sprague, of Boston; treasurer, Frederick W. Stone, of Newton. Certificate approved April 3, 1899.

EVANSVILLE, IND.—The Shrader Headlight Company, with a capital stock of $10,000, has been incorporated.

New Electric Railways.

COLUMBUS, OHIO — The Central Ohio Traction Company has been incorporated for the purpose of operating an electric road between Galion, Bucyrus and Crestline. The company is authorized to issue $225,000 capital stock.

LAPORTE, IND.—Hon. J. W. Lovett, of Anderson, has recently organized a company for the building and equipment of an electric railway from Laporte to Michigan City. The road will be 14 miles long, costing, when complete, from $150,000 to $200,000.

JACKSON, MICH.—The Jackson & Adrian Electric Railway Company has been organized with a capital stock of $50,000. The incorporators are H. C. Smith, H. V. C. Hart, H. A. Fee, A. P. Southworth, Leon Decker, Frank E. Priddle and H. B. Waldby, of Adrian; Charles A. Blair, Charles H. Smith and Charles E. Townsend, of Jackson; and Lester O. Goddard, of Chicago.

CORSICANA, TEX. — William G. Baker, of Corsicana, and E. N. Cullom, of Birmingham, Ala., have applied to the City Council for a franchise to build and operate an electric street railroad in this city.

The Cutler-Hammer Manufacturing Company.

As recently announced, the Cutler-Hammer Manufacturing Company, of 76 West Jackson street, Chicago, manufacturers of the well known "C-H" rheostats, have increased their capital stock from $50,000 to $100,000. The concern was originally incorporated with a capital stock of only $10,000, but as time subsequently proved that sum to be insufficient for the demands of the business, it was at various times increased to $25,000 to $50,000, respectively. This last jump to $100,000 makes the fourth increase in six years. The company is at present splendidly equipped to produce its rheostats economically and quickly, and employs only the best material and skilled labor in their construction.

Immediately in control of the company's affairs are F. R. Bacon, president; F. L. Pierce, vice-president; J. Gilbert Hickcox, secretary and treasurer. Much of the success of this concern is due to the ability of general manager H. H. Cutler, who designs all the apparatus.

A New Telephone Handbook.

"Handbuch der Telephonie."—The well known German publisher, A. Hartleben, has recently issued a second edition of Dr. Victor Wietlisbach's "Handbuch der Telephonie." It will be remembered that the author was the chief of the Swiss telegraph department, and enjoyed the well earned reputation of being one of the leading telephone engineers of the world. With the exception of Preece, no European telephonist has published so many valuable original papers and researches, both on practical and scientific subjects, relating to the transmission of sound by electricity. Indeed, so valuable were Wietlisbach's papers that in 1896 the editors of *Electrical Engineering* asked the author for permission to translate a portion of his "Handbuch der Telephonie." In the preface it was stated that "Dr. Wietlisbach's work is the most complete and exhaustive book that has ever been published on telephony," and it may be added, he was one of the most lucid and elegant scientific writers. The "Handbuch," published by Hartleben, is a posthumous collection and edition of the most valuable papers of Wietlisbach, and is really a work of love performed by his lifelong friend, Dr. Robert Weber, professor of the Academy of Science, Neuchatel. The book in its present form is a most valuable compendium of all matters appertaining to telephony. Even the casual reader can not fail to be impressed with the thoroughness with which the various subjects are handled. Wherever mathematical demonstration is requir[illegible] for the elucidation of physical phenomena, the author has taken great pains to give them, and this part of the work alone will prove a great boon to the present and future student of telephony. Starting with an exposition of physical laws underlying sound-waves, the reader is taken along step by step until, from a knowledge of the most simple telephonic apparatus, he is made acquainted with the latest and most improved central office switching devices and the various systems used for multiple telephony and the simultaneous transmission of telegraphic and telephonic signals. Of special interest also is the chapter devoted to the study of telephone cables and the construction of long-distance lines. In short, "das Handbuch der Telephonie" should be the *vade mecum* of every educated modern telephone engineer.

Mr. Geo. W. Vallee, the well known Philadelphia electrical supply dealer, visited New York city last week.